United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with
South Dakota Agricultural
Experiment Station at
South Dakota State
University

Soil Survey of Brookings County, South Dakota

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How To Use This Soil Survey

General Soil Map

The general soil map, which is a color map, shows the survey area divided into groups of associated soils called general soil map units or associations. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

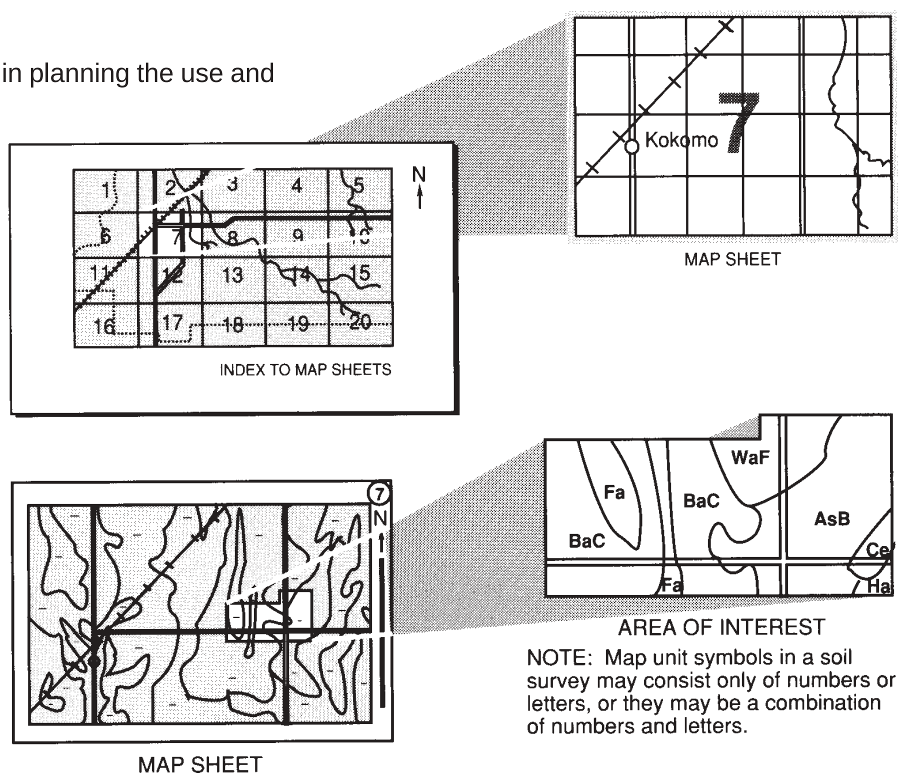
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.



This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1994. Soil names and descriptions were approved in 1995. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1995. This survey was made cooperatively by the Natural Resources Conservation Service and the South Dakota Agricultural Experiment Station at South Dakota State University. The survey is part of the technical assistance furnished to the Brookings County Conservation District. Some financial assistance was provided by Brookings County.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Contour farming and terraces in an area of Barnes clay loam, 2 to 6 percent slopes.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service homepage on the World Wide Web. The address is http://www.nrcs.usda.gov.

Contents

Issued 2004

Foreword

This soil survey contains information that can be used in land-planning programs in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for optimum food and fiber production and for protection of the soil, water, air, plant, and animal resources. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations that affect various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described, and information on specific uses is given. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service, the South Dakota Cooperative Extension Service, or the South Dakota Agricultural Experiment Station at South Dakota State University.

Janet L. Oertly
State Conservationist
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Soil Survey of
Brookings County, South Dakota

By Walter T. Schaefer, Jr.

Fieldwork by Walter T. Schaefer, Jr., David H. Tufvesson, Mary Lou Woolf, Regis L. Vialle, and Wayne J. Bachman, Natural Resources Conservation Service, and Kenneth F. Miller, David V. Wroblewski, and Peter L. Smith, private contractors

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the South Dakota Agricultural Experiment Station at South Dakota State University

Brookings County is in east-central South Dakota (fig. 1). It has a total area of 514,933 acres.

This soil survey updates the survey of Brookings County published in 1959 (Westin, 1959). It provides additional information and has new maps, which show the soils in greater detail.

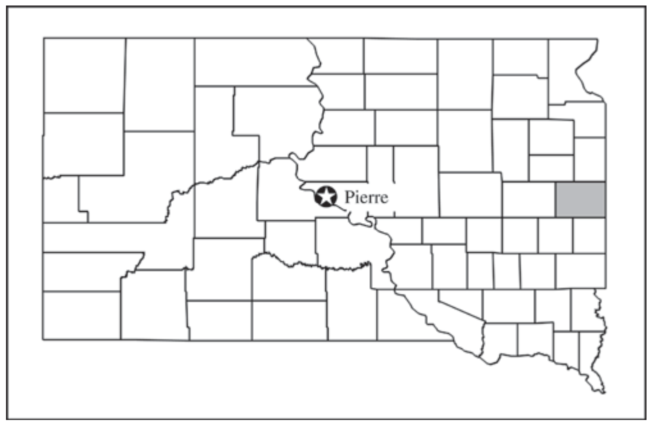

Figure 1.—Location of Brookings County in South Dakota.

General Nature of the County

This section provides general information about Brookings County. It describes climate; physiography, relief, and drainage; settlement; farming; and natural resources.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Brookings, South Dakota, in the period 1961 to 1990. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 14 degrees F and the average daily minimum temperature is 3 degrees F. The lowest temperature on record, which occurred on February 9, 1899, was -41 degrees F. In summer, the average temperature is 68 degrees F. The highest recorded temperature, which occurred on July 24, 1940, was 109 degrees F.

Growing degree days are shown in table 1. They are equivalent to “heat units.” During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 23 inches. Of this total, about 18 inches, or 78 percent, usually falls in April through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 5.54 inches on June 25, 1980. Thunderstorms occur on about 44 days each year, and most occur in July.

The average seasonal snowfall is about 25 inches. The greatest snow depth at any one time during the period of record was 40 inches. On the average, 100

days of the year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record is 25 inches.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 81 percent. The sun shines 75 percent of the time possible in summer and 57 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 12 miles per hour, in May.

Physiography, Relief, and Drainage

Brookings County is entirely on the Coteau des Prairies, a high land plateau that extends across the county in a southeasterly direction (Flint, 1955). This plateau is the most conspicuous land feature in northeastern South Dakota.

Brookings County is divided into four geographic parts. The western one-third of the county consists of a silty glacial till plain and moraine and has many small depressions and lakes. This section of the county is dominantly nearly level to gently rolling. The drainage pattern is poorly defined in most areas but is well defined along the larger drainageways.

The flood plain and outwash plain along the Big Sioux River separate the western one-third of the county from the eastern two-thirds. The tributaries of the Big Sioux River and its outwash plains are also included in this physiographic region. The region consists dominantly of broad, level and nearly level, moderately well drained to very poorly drained flood plains and well drained outwash plains above the flood plains.

East of the Big Sioux River flood plain is a till plain consisting of loamy glacial till. Some areas have a mantle of loess, loamy eolian material, or sandy material. The till plain is dominantly nearly level to gently rolling. The drainage pattern is well defined. The eastern part of the county is drained by Deer, Medary, North Deer, and Six Mile Creeks, which flow in a southwesterly direction and empty into the Big Sioux River.

The extreme northeastern part of the county consists of a loamy glacial till plain and moraine with many small depressions and lakes. Many areas have a mantle of silty glacial till. Some soils in this physiographic area are earthworm worked. The region is dominantly nearly level to gently rolling. The drainage pattern is poorly defined in most areas.

Land elevation ranges from about 1,988 feet above sea level 1 mile east of Six Mile Creek, along the Brookings-Deuel County line, to about 1,565 feet above sea level at the point where the Big Sioux River flows out of the county.

Settlement

Brookings County was organized in 1871 by an act of the first Dakota Territorial legislature (Brookings County History Book Committee, 1989). It was named in honor of an influential territorial figure, Wilmont W. Brookings. The original county included all of the present county, the eastern townships of Kingsbury County, the northern half of Moody County, and the northeastern six townships of Lake County. The present boundaries were established in 1873. Medary became the county seat and remained so until 1879, when the seat of government was moved to Brookings.

The first permanent settlers came to the area in the 1850s. The 1870s marked a large influx of European settlers. The ethnic background of the county residents is primarily German, English, Irish, and Norwegian.

The population of the county was 4,965 in 1880 and has continued to grow. In 1990, Brookings County had a population of 25,207 and Brookings, the largest town in the county, had a population 16,270. Other towns in the county include Aurora (population 619), Bruce (population 235), Bushnell (population 81), Elkton (population 602), Sinai (population (120), Volga (population 1,263), and White (population 563).

Railroads played a big part in the settlement of the county and have served the county since 1879. The main highways in the county are U.S. Highways 14 and 81; Interstate 29; and South Dakota Highways 13, 30, and 218. Most rural areas are served by all-weather roads, which carry traffic to centers of trade.

Farming

Farming is the principal enterprise in Brookings County. About 68 percent of farm income is derived from the sale of livestock and livestock products (U.S. Department of Commerce, 1999). The rest is derived mainly from the sale of corn, soybeans, and small grain. Some of the crops are used as feed for livestock.

In 1997, there were 886 farms in the county. The farms averaged about 460 acres in size (U.S. Department of Commerce, 1999). The trend is toward fewer and larger farms.

About 64 percent of the acreage in the county is used for cultivated crops, and 7 percent is used for tame pasture or as hayland (U.S. Department of Commerce, 1999). Dryland farming is dominant. About

3 percent of the land is irrigated (U.S. Department of Commerce, 1999). All irrigation in the county is by the sprinkler method.

The main cropping system in the county is a sequence of row crops, small grain, and alfalfa. Corn, soybeans, oats, wheat, and barley are the main cultivated crops. Alfalfa, intermediate wheatgrass, and smooth bromegrass are the main crops grown for hay. Corn is grown mainly for grain, but a small amount is grown for silage.

The Brookings County Soil Conservation District was organized in 1944 (History Committee of the South Dakota Association of Soil and Water Conservation Districts, 1969). The District has been instrumental in planting grass, planting trees, and applying other conservation practices to help control erosion. The trees also provide protection for farmsteads and habitat for wildlife.

Natural Resources

Soil is the most important natural resource in the county. It provides a growing medium for crops and for the grass grazed by livestock. Other natural resources are water, sand and gravel, and wildlife.

The main sources of water for domestic uses and for livestock are shallow wells drilled to a depth of about 30 to 250 feet (Hamilton, 1989). Five major glacial aquifers underlie Brookings County. The Big Sioux aquifer is the major source of shallow, fresh ground water suitable for municipal, rural-domestic, livestock, and irrigation purposes. Dugouts in areas of Lamoure, Parnell, and Oldham soils and dams constructed in small, deep drainageways provide additional water for livestock and wildlife.

Deposits of sand and gravel are extensive in Brookings County (Tomhave, 1988). Significant deposits of sand and gravel are in areas of the Estelline-Brandt, Fordville-Renshaw, Fordtown-Renwash-Allivar, and Divide-Lamoure-Marysland soil associations, which are described under the heading “General Soil Map Units.” Because of an excessive amount of fine rock fragments, such as shale, chalk, and clay ironstone, most of the sand and gravel is unsuitable for use as concrete aggregate or as construction material. It is suitable, however, for use as subgrade material for roads and as bituminous aggregate.

Wildlife in the county includes whitetail deer and upland game birds, such as pheasant and Hungarian partridge. The potholes and wetland areas provide habitat for waterfowl. Seven major glacial lakes in the county contain fish, such as bullhead, northern pike, perch, and walleye.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically.

Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in the adjacent published surveys of Hamlin, Moody, and Lake Counties in South Dakota and of Lincoln County, Minnesota. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

Some of the soil maps include areas that were not mapped using the methods described in the previous paragraphs. These are areas where access to the land was denied. Soil maps of this land were made using available remote sensing materials. Reduced reliability of the soil map can be expected in areas where access was denied. The locations of these areas are as follows:

SE$^{1}/_{4}$ section 25, T. 109 N., R. 49 W.
SE$^{1}/_{4}$ section 14, T. 109 N., R. 49 W.
E$^{1}/_{2}$NW$^{1}/_{4}$ section 20, T. 111 N., R. 47 W.
W$^{1}/_{2}$NE$^{1}/_{4}$ section 20, T. 111 N., R. 47 W.
NW$^{1}/_{4}$ section 9, T. 110 N., R. 49 W.
W$^{1}/_{2}$W$^{1}/_{2}$NE$^{1}/_{4}$ section 9, T. 110 N., R. 49 W.
S$^{1}/_{2}$ section 10, T. 110 N., R. 49 W.
E$^{1}/_{2}$ section 14, T. 110 N., R. 49 W.
SW$^{1}/_{4}$ section 13, T. 110 N., R. 49 W.
SE$^{1}/_{4}$ section 14, T. 110 N., R. 48 W.
N$^{1}/_{2}$NE$^{1}/_{4}$ section 23, T. 110 N., R. 48 W.
E$^{1}/_{2}$NE$^{1}/_{4}$ section 19, T. 112 N., R. 50 W.
W$^{1}/_{2}$NW$^{1}/_{4}$ section 20, T. 112 N., R. 50 W.

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. These broad areas are called associations. Each association on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils and some minor soils. It is named for the major soils. The components of one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management. Because the associations consist of broad groupings, not all management concerns are listed for each association. In any given association, the different soil types could have different management concerns under certain circumstances.

The soils in the associations are in different landform positions (fig. 2). These landform positions affect such characteristics as the amount of topsoil, the drainage class, the runoff rate, and the content of organic matter.

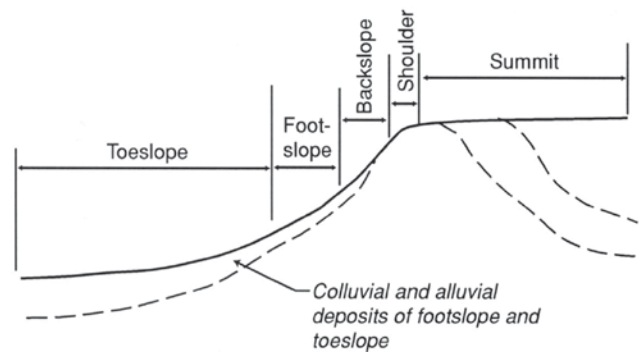

Figure 2.—Landform positions.

Level to Steep, Silty and Loamy Soils on Till Plains, Moraines, Flood Plains, Outwash Plains, and Ice-walled Lake Plains

These soils formed in glacial till, glaciolacustrine sediments, glacial outwash, and alluvium. They make up about 74 percent of the county. Most areas are used for cultivated crops. The steeper areas are used as pastureland, hayland, or rangeland. The hazards of wind erosion and water erosion, a high content of lime, flooding, and agrochemical leaching are important management concerns if the major soils are cropped. Measures that conserve moisture also are needed. Proper grazing management is an important concern in areas of pasture and rangeland.

1. Poinsett-Buse-Waubay Association

Well drained and moderately well drained, nearly level to gently rolling, silty and loamy soils on till plains and moraines (fig. 3)

Composition

Extent of the association in the survey area: 24 percent

Extent of the soils in the association:
- Poinsett soils—29 percent
- Buse soils—25 percent
- Waubay soils—15 percent
- Soils of minor extent—31 percent

Setting

Landform: Till plains

Position on the landform: Poinsett—summits and backslopes; Buse—shoulders; Waubay—footslopes

Slope range: Poinsett—0 to 9 percent; Buse—mainly 3 to 9 percent (9 to 40 percent in some areas); Waubay—0 to 6 percent

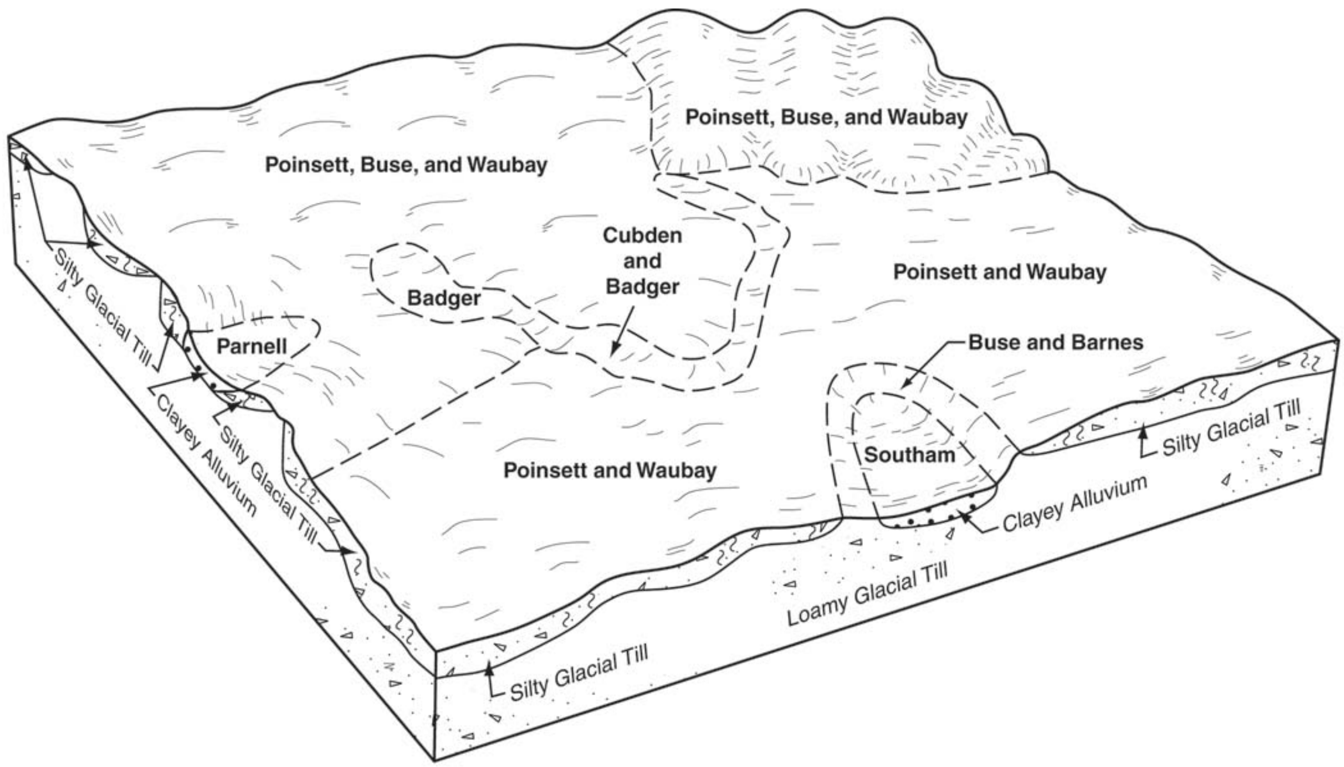

Figure 3.—Typical pattern of soils and parent material in the Poinsett-Buse-Waubay association.

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Buse—well drained; Waubay—moderately well drained
Texture of the surface layer: Poinsett—silty clay loam; Buse—loam; Waubay—silty clay loam
Depth to bedrock: Very deep
Depth to contrasting layer: Poinsett—more than 40 inches over loamy glacial till; Buse—more than 60 inches; Waubay—more than 40 inches over loamy glacial till
Depth to water table: Poinsett—more than 6 feet; Buse—more than 6 feet; Waubay—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Poinsett—moderate; Buse—moderately slow; Waubay—moderate
Available water capacity: High
Content of organic matter: Poinsett—high; Buse—moderately low; Waubay—high
Surface runoff: Poinsett—low or medium; Buse—medium; Waubay—low or medium

Minor Soils

- The somewhat poorly drained Badger soils on toeslopes
- The well drained Barnes soils, which have free carbonates below a depth of 10 inches and formed entirely in loamy glacial till; on backslopes
- The somewhat poorly drained, calcareous Cubden soils on footslopes
- The somewhat poorly drained and poorly drained Lamoure soils on low flood plains
- The very poorly drained Parnell and very poorly drained, calcareous Oldham soils in basins
- The very poorly drained, ponded Southam soils in basins

Use and Management

Major use: About 80 percent cropland
Other uses: About 10 percent rangeland and 5 percent pasture and hayland
Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Suited

Management concerns: Poinsett and Waubay—water erosion in areas that have slopes of more than 2 percent; Buse—wind erosion, water erosion, and a high content of lime

2. Poinsett-Waubay Association

Well drained and moderately well drained, nearly level to undulating, silty soils on till plains

Composition

Extent of the association in the survey area: 1 percent
Extent of the soils in the association:
Poinsett soils—50 percent
Waubay soils—23 percent
Soils of minor extent—27 percent

Setting

Landform: Till plains
Position on the landform: Poinsett—summits and backslopes; Waubay—footslopes
Slope range: Poinsett—mainly 0 to 6 percent (6 to 9 percent in some areas); Waubay—mainly 0 to 2 percent (2 to 6 percent in some areas)

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Waubay—moderately well drained
Texture of the surface layer: Silty clay loam
Depth to bedrock: Very deep
Depth to contrasting layer: More than 40 inches over loamy glacial till
Depth to water table: Poinsett—more than 6 feet; Waubay—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Poinsett—low or medium; Waubay—low

Minor Soils

- The somewhat poorly drained Badger soils on toeslopes
- The calcareous Buse soils, which formed entirely in loamy glacial till; on shoulders
- The somewhat poorly drained, calcareous Cubden soils on footslopes
- The very poorly drained Oldham and Southam soils in basins
- The poorly drained Tonka and very poorly drained Parnell soils in basins

Use and Management

Major use: About 90 percent cropland
Other uses: About 5 percent pasture and hayland
Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Suited
Management concerns: Water erosion in areas that have slopes of more than 2 percent

3. Poinsett-Hetland-Waubay Association

Well drained and moderately well drained, nearly level to undulating, silty soils on till plains and ice-walled lake plains

Composition

Extent of the association in the survey area: 1 percent
Extent of the soils in the association:
Poinsett soils—26 percent
Hetland soils—20 percent
Waubay soils—13 percent
Soils of minor extent—41 percent

Setting

Landform: Till plains and ice-walled lake plains
Position on the landform: Poinsett—summits and backslopes; Hetland—summits; Waubay—footslopes
Slope range: Poinsett—mainly 0 to 6 percent (6 to 15 percent in some areas); Hetland—0 to 6 percent; Waubay—mainly 0 to 2 percent (2 to 6 percent in some areas)

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Hetland—well drained; Waubay—moderately well drained
Texture of the surface layer: Silty clay loam
Depth to bedrock: Very deep
Depth to contrasting layer: Poinsett—more than 40 inches over loamy glacial till; Waubay—more than 40 inches over loamy glacial till; Hetland—more than 60 inches
Depth to water table: Poinsett—more than 6 feet; Hetland—more than 6 feet; Waubay—3.5 to 5.0 feet

Flooding: None
Ponding: None
Permeability: Poinsett—moderate; Hetland—slow; Waubay—moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Poinsett—low or medium; Hetland—low or medium; Waubay—low

Minor Soils

- The somewhat poorly drained Badger soils on toeslopes
- The well drained Barnes soils, which have more sand and less silt in the surface layer and subsoil than the Poinsett soils; on summits and backslopes
- The well drained, loamy, calcareous Buse soils on shoulders
- The somewhat poorly drained, calcareous, silty Cubden soils on footslopes
- The somewhat poorly drained, calcareous, loamy Hamerly soils on footslopes
- The very poorly drained, calcareous Oldham and Southam soils in basins
- The very poorly drained Parnell soils in basins

Use and Management

Major use: About 75 percent cropland
Other uses: About 10 percent rangeland and 10 percent pasture and hayland
Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Suited
Management concerns: Water erosion in areas that have slopes of more than 2 percent

4. Egan-Ethan-Trent Association

Well drained and moderately well drained, nearly level to rolling, silty and loamy soils on till plains and moraines

Composition

Extent of the association in the survey area: Less than 1 percent
Extent of the soils in the association:
Egan and similar soils—38 percent
Ethan and similar soils—26 percent
Trent soils—14 percent
Soils of minor extent—22 percent

Setting

Landform: Till plains and moraines
Position on the landform: Egan—summits and backslopes; Ethan—shoulders; Trent—footslopes
Slope range: Egan—2 to 9 percent; Ethan—2 to 15 percent; Trent—0 to 2 percent

Soil Properties and Qualities

Drainage class: Egan—well drained; Ethan—well drained; Trent—moderately well drained
Texture of the surface layer: Egan—silty clay loam; Ethan—loam; Trent—silty clay loam
Depth to bedrock: Very deep
Depth to contrasting layer: Egan—24 to 40 inches over loamy glacial till; Ethan—more than 60 inches; Trent—more than 40 inches over loamy glacial till
Depth to water table: Egan—more than 6 feet; Ethan—more than 6 feet; Trent—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Egan—moderately slow; Ethan—moderately slow; Trent—moderate
Available water capacity: High
Content of organic matter: Egan—high; Ethan—moderately low; Trent—high
Surface runoff: Egan—medium; Ethan—medium or high; Trent—low

Minor Soils

- The somewhat poorly drained Chancellor soils on toeslopes
- The moderately well drained, calcareous Wakonda soils on footslopes
- The very poorly drained Worthing soils in basins

Use and Management

Major use: About 85 percent cropland
Other uses: About 5 percent rangeland and 5 percent pasture and hayland
Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Suited
Management concerns: Egan—water erosion in areas that have slopes of more than 2 percent; Ethan—water erosion, wind erosion, and a high content of lime; Trent—few limitations

5. Singsaas-Buse-Waubay Association

Well drained and moderately well drained, nearly level to gently rolling, silty and loamy soils on till plains and moraines

Composition

Extent of the association in the survey area: 3 percent
Extent of the soils in the association:
Singsaas soils—37 percent
Buse soils—19 percent

Waubay soils—11 percent
Soils of minor extent—33 percent

Setting

Landform: Till plains and moraines
Position on the landform: Singsaas—summits and backslopes; Buse—shoulders; Waubay—footslopes
Slope range: Singsaas—0 to 9 percent; Buse—mainly 3 to 9 percent (9 to 20 percent in some areas); Waubay—0 to 6 percent

Soil Properties and Qualities

Drainage class: Singsaas—well drained; Buse—well drained; Waubay—moderately well drained
Texture of the surface layer: Singsaas—silty clay loam; Buse—loam; Waubay—silty clay loam
Depth to bedrock: Very deep
Depth to contrasting layer: Singsaas—10 to 20 inches over loamy glacial till; Buse—more than 60 inches; Waubay—more than 40 inches over loamy glacial till
Depth to water table: Singsaas—more than 6 feet; Buse—more than 6 feet; Waubay—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Singsaas—moderately slow; Buse—moderately slow; Waubay—moderate
Available water capacity: High
Content of organic matter: Singsaas—high; Buse—moderately low; Waubay—high
Surface runoff: Singsaas—low or medium; Buse—medium; Waubay—low or medium

Minor Soils

- The somewhat poorly drained Badger soils on toeslopes
- The well drained Barnes soils, which formed in loamy glacial till; on summits and backslopes
- The somewhat poorly drained, calcareous, silty McIntosh soils on footslopes
- The somewhat poorly drained, calcareous, loamy Hamerly soils on footslopes
- The somewhat poorly drained and poorly drained Lamoure soils and the very poorly drained Rauville soils on low flood plains
- The very poorly drained Parnell and Southam soils in basins

Use and Management

Major use: About 85 percent cropland
Other uses: About 10 percent pasture and hayland
Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Suited
Management concerns: Singsaas and Waubay—water erosion in areas that have slopes of more than 2 percent; Buse—wind erosion, water erosion, and a high content of lime

6. Kranzburg-Brookings Association

Well drained and moderately well drained, nearly level and gently sloping, silty soils on till plains (fig. 4)

Composition

Extent of the association in the survey area: 20 percent
Extent of the soils in the association:
Kranzburg and similar soils—50 percent
Brookings soils—23 percent
Soils of minor extent—27 percent

Setting

Landform: Till plains
Position on the landform: Kranzburg—summits and backslopes; Brookings—footslopes
Slope range: Kranzburg—0 to 6 percent; Brookings—0 to 2 percent

Soil Properties and Qualities

Drainage class: Kranzburg—well drained; Brookings—moderately well drained
Texture of the surface layer: Silty clay loam
Depth to bedrock: Very deep
Depth to contrasting layer: 20 to 40 inches over loamy glacial till
Depth to water table: Kranzburg—more than 6 feet; Brookings—3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Kranzburg—low or medium; Brookings—low

Minor Soils

- The somewhat poorly drained Badger soils on toeslopes
- The well drained Barnes soils, which formed entirely in loamy glacial till; on summits and backslopes
- The calcareous Buse soils on shoulders
- Doland soils, which contain more sand in the subsoil than the Kranzburg soils; on summits and backslopes
- The somewhat poorly drained and poorly drained, calcareous Lamoure soils on low flood plains

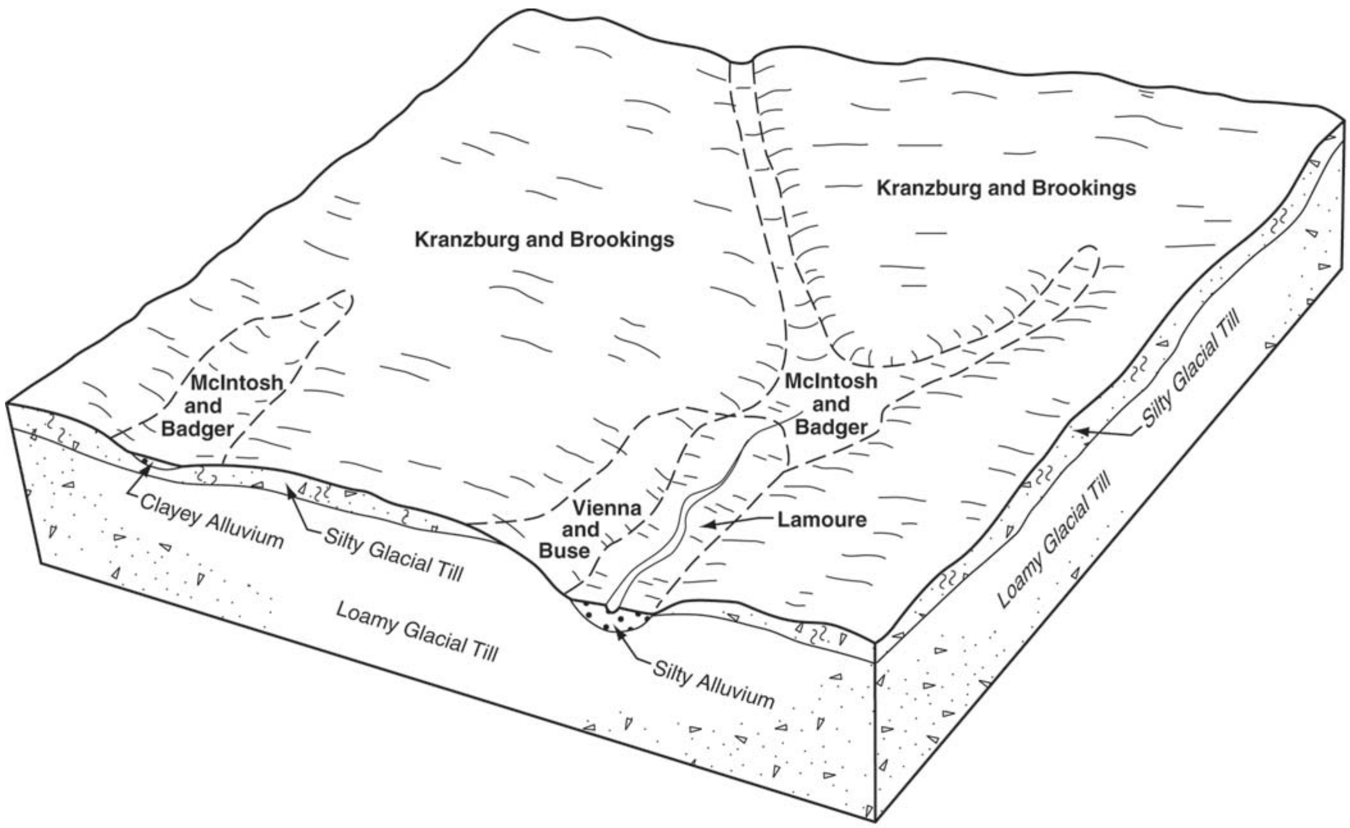

Figure 4.—Typical pattern of soils and parent material in the Kranzburg-Brookings association.

- The somewhat poorly drained McIntosh soils on footslopes
- The well drained Strayhoss soils, which have sandy material at a depth of 20 to 40 inches; on summits and backslopes

Use and Management

Major use: About 90 percent cropland
Other uses: About 5 percent pasture and hayland
Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Suited
Management concerns: Kranzburg—water erosion in areas that have slopes of more than 2 percent; Brookings—few limitations

7. Vienna-Brookings Association

Well drained and moderately well drained, nearly level and gently sloping, silty soils on till plains

Composition

Extent of the association in the survey area: 5 percent
Extent of the soils in the association:
Vienna soils—46 percent
Brookings soils—21 percent
Soils of minor extent—33 percent

Setting

Landform: Till plains
Position on the landform: Vienna—summits and backslopes; Brookings—footslopes
Slope range: Vienna—mainly 0 to 6 percent (6 to 9 percent in some areas); Brookings—0 to 2 percent

Soil Properties and Qualities

Drainage class: Vienna—well drained; Brookings—moderately well drained
Texture of the surface layer: Vienna—silt loam; Brookings—silty clay loam
Depth to bedrock: Very deep
Depth to contrasting layer: Vienna—10 to 20 inches over loamy glacial till; Brookings—20 to 40 inches over loamy glacial till
Depth to water table: Vienna—more than 6 feet; Brookings—3 to 5 feet
Flooding: None

Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Vienna—low or medium; Brookings—low

Minor Soils

- The somewhat poorly drained Badger soils on toeslopes
- Barnes soils, which have more sand and less silt in the surface layer and subsoil than the major soils; on summits and backslopes
- The calcareous Buse soils on shoulders
- Kranzburg soils, which have loamy glacial till at a depth of 20 to 40 inches; on backslopes
- The somewhat poorly drained and poorly drained Lamoure soils on low flood plains
- The somewhat poorly drained, calcareous McIntosh soils on footslopes

Use and Management

Major use: About 90 percent cropland
Other uses: About 5 percent pasture and hayland
Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Suited
Management concerns: Vienna—water erosion in areas that have slopes of more than 2 percent; Brookings—few limitations

8. Barnes Association

Well drained, nearly level to undulating, loamy soils on till plains (fig. 5)

Composition

Extent of the association in the survey area: 11 percent
Extent of the soils in the association:
Barnes soils—70 percent
Soils of minor extent—30 percent

Setting

Landform: Till plains
Position on the landform: Summits and backslopes
Slope range: 0 to 6 percent

Soil Properties and Qualities

Drainage class: Well drained
Texture of the surface layer: Clay loam
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Low or medium

Minor Soils

- The somewhat poorly drained Badger soils on toeslopes
- The calcareous Buse soils on shoulders
- The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on backslopes and footslopes
- The somewhat poorly drained, calcareous Hamerly soils on footslopes
- The moderately well drained Svea soils on footslopes
- The somewhat poorly drained and poorly drained Lamoure soils on low flood plains
- The well drained Vienna soils, which have loamy glacial till at a depth of 10 to 20 inches; on summits and backslopes

Use and Management

Major use: About 90 percent cropland
Other uses: About 5 percent pasture and hayland
Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Suited
Management concerns: Water erosion in areas that have slopes of more than 2 percent

9. Buse-Barnes-Lamoure Association

Well drained, somewhat poorly drained, and poorly drained, level to steep, loamy and silty soils on moraines and flood plains (fig. 6)

Composition

Extent of the association in the survey area: 4 percent
Extent of the soils in the association:
Buse soils—43 percent
Barnes soils—17 percent
Lamoure soils—10 percent
Soils of minor extent—30 percent

Setting

Landform: Moraines and flood plains
Position on the landform: Buse—shoulders; Barnes—summits and backslopes; Lamoure—low flood plains

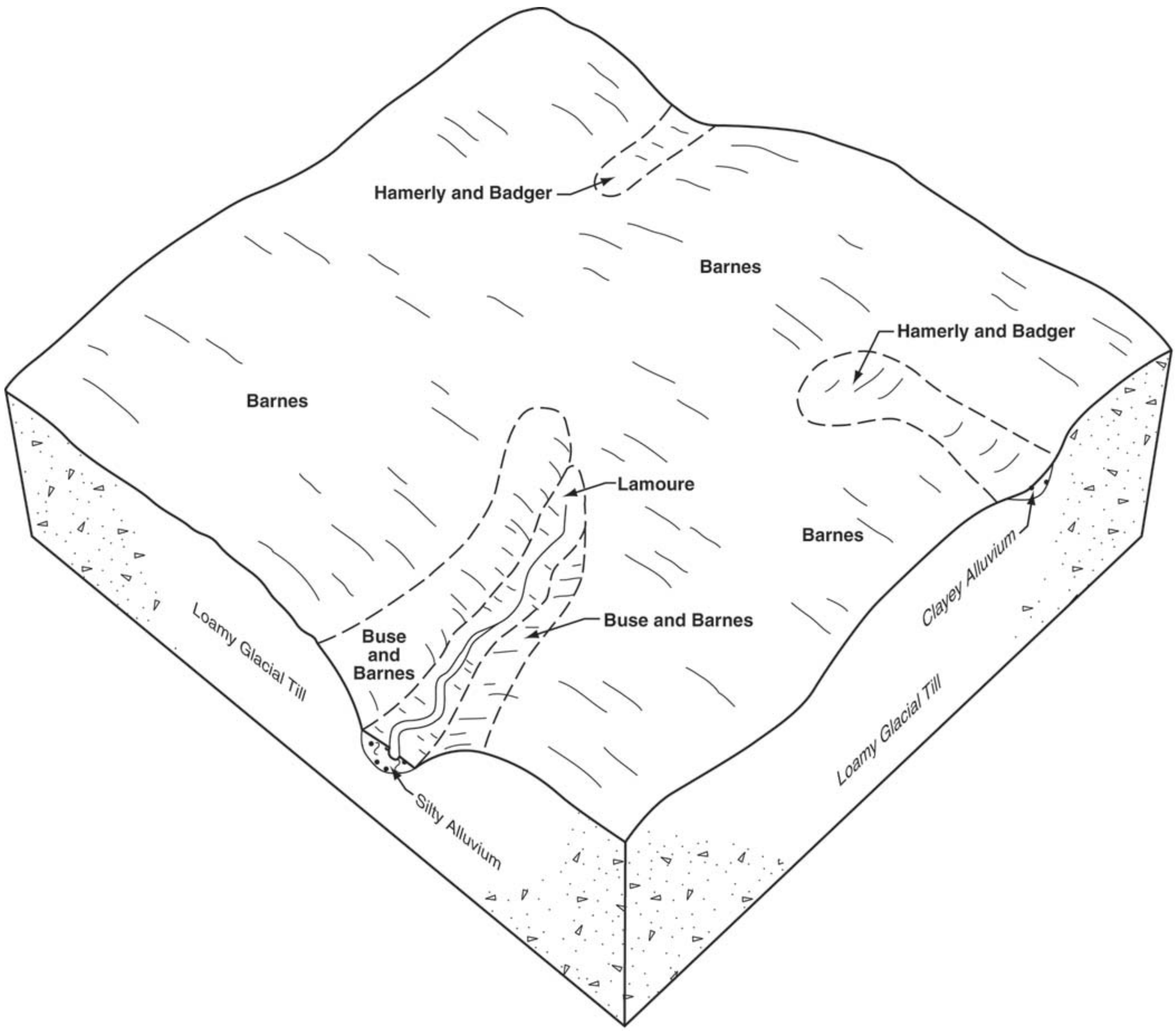

Figure 5.—Typical pattern of soils and parent material in the Barnes association.

Slope range: Buse—6 to 40 percent; Barnes—2 to 15 percent; Lamoure—0 to 1 percent

Soil Properties and Qualities

Drainage class: Buse—well drained; Barnes—well drained; Lamoure—somewhat poorly drained and poorly drained

Texture of the surface layer: Buse—loam; Barnes—loam; Lamoure—silty clay loam

Depth to bedrock: Very deep

Depth to contrasting layer: More than 60 inches

Water table: Buse—at a depth of more than 6 feet; Barnes—at a depth of more than 6 feet; Lamoure—at the surface to 2 feet below the surface

Flooding: Buse—none; Barnes—none; Lamoure—occasional or frequent for brief periods

Ponding: None

Permeability: Moderately slow

Available water capacity: High

Content of organic matter: Buse—moderate or moderately low; Barnes—high; Lamoure—high

Surface runoff: Buse—medium to very high; Barnes—medium; Lamoure—very low

Minor Soils

- The well drained Darnen soils, which formed in loamy alluvium; on footslopes
- The well drained Fordtown soils, which have gravelly material at a depth of 20 to 40 inches; on high flood plains
- The well drained, calcareous Langhei soils, which do not have dark colors below a depth of 7 inches; on shoulders
- The very poorly drained Rauville soils on low flood plains
- The well drained Singsaas soils, which formed in a silty mantle over loamy glacial till; on summits and backslopes
- The excessively drained Sioux soils on summits and shoulders
- The well drained Vienna soils, which have 10 to 20 inches of loess over loamy glacial till; on summits and backslopes

Use and Management

Major use: About 75 percent rangeland
Other uses: About 10 percent cropland and 10 percent pasture and hayland
Suitability for crops: Generally unsuited
Management concerns: Buse—wind erosion, water erosion, and a high content of lime; Barnes—water erosion; Lamoure—flooding, high water table, and a high content of lime

10. Doland-Svea-Strayhoss Association

Well drained, nearly level and gently sloping, loamy soils on till plains

Composition

Extent of the association in the survey area: 2 percent

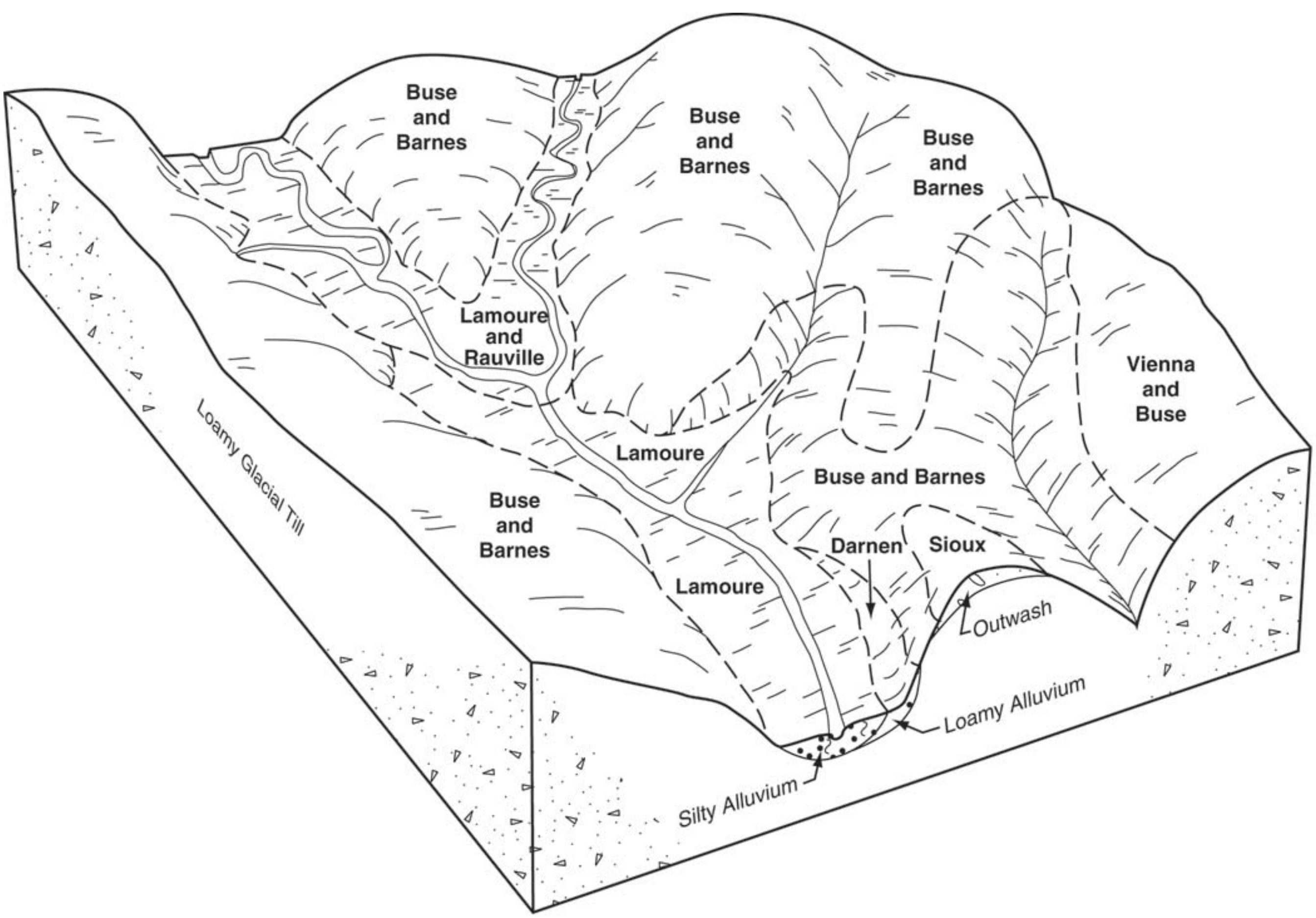

Figure 6.—Typical pattern of soils and parent material in the Buse-Barnes-Lamoure association.

Extent of the soils in the association:
Doland and similar soils—44 percent
Svea and similar soils—12 percent
Strayhoss and similar soils—12 percent
Soils of minor extent—32 percent

Setting

Landform: Till plains
Position on the landform: Doland—summits and backslopes; Svea—footslopes; Strayhoss—backslopes
Slope range: Doland—0 to 6 percent; Svea—0 to 2 percent; Strayhoss—0 to 6 percent

Soil Properties and Qualities

Drainage class: Doland—well drained; Svea—moderately well drained; Strayhoss—well drained
Texture of the surface layer: Loam
Depth to bedrock: Very deep
Depth to contrasting layer: Doland—15 to 30 inches over loamy glacial till; Svea—more than 60 inches; Strayhoss—20 to 40 inches over sandy material
Depth to water table: Doland—more than 6 feet; Svea—3 to 5 feet; Strayhoss—more than 6 feet
Flooding: None
Ponding: None
Permeability: Doland—moderately slow; Svea—moderately slow; Strayhoss—moderate
Available water capacity: Doland—high; Svea—high; Strayhoss—moderate
Content of organic matter: High
Surface runoff: Doland—low or medium; Svea—low; Strayhoss—low or medium

Minor Soils

- The somewhat poorly drained Badger soils on toeslopes
- The well drained Barnes soils, which formed in loamy glacial till; on summits and backslopes
- The well drained, calcareous Buse soils on shoulders
- The moderately well drained Embden soils, which contain more sand throughout than the major soils; on footslopes
- The somewhat poorly drained, calcareous Hamerly soils on footslopes
- The somewhat poorly drained and poorly drained Lamoure soils on low flood plains
- The well drained Lanona soils, which contain more sand in the upper part than the major soils; on summits and backslopes
- The somewhat excessively drained, sandy Maddock soils on summits and backslopes
- The moderately well drained Swenoda soils, which contain more sand in the upper part than the major soils; on footslopes

Use and Management

Major use: About 85 percent cropland
Other uses: About 10 percent pasture and hayland
Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Suited
Management concerns: Water erosion in areas that have slopes of more than 2 percent

11. Strayhoss-Maddock-Doland Association

Well drained and somewhat excessively drained, nearly level and gently sloping, loamy soils on till plains and outwash plains

Composition

Extent of the association in the survey area: 1 percent
Extent of the soils in the association:
Strayhoss and similar soils—39 percent
Maddock soils—11 percent
Doland and similar soils—11 percent
Soils of minor extent—39 percent

Setting

Landform: Till plains and outwash plains
Position on the landform: Strayhoss—summits and backslopes; Maddock—summits, shoulders, and backslopes; Doland—summits and backslopes
Slope range: Strayhoss—0 to 6 percent; Maddock—mainly 0 to 6 percent (6 to 9 percent in some areas); Doland—0 to 6 percent

Soil Properties and Qualities

Drainage class: Strayhoss—well drained; Maddock—somewhat excessively drained; Doland—well drained
Texture of the surface layer: Strayhoss—loam; Maddock—sandy loam; Doland—loam
Depth to bedrock: Very deep
Depth to contrasting layer: Strayhoss—20 to 40 inches to sandy material; Maddock—more than 60 inches; Doland—15 to 30 inches to loamy glacial till
Depth to water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Strayhoss—moderate; Maddock—rapid; Doland—moderately slow

Available water capacity: Strayhoss—moderate; Maddock—low; Doland—high
Content of organic matter: Strayhoss—high; Maddock—moderately low; Doland—high
Surface runoff: Strayhoss—low or medium; Maddock—very low; Doland—low or medium

Minor Soils

- The somewhat poorly drained Badger soils on toeslopes
- The moderately well drained Brookings soils, which formed in 20 to 40 inches of loess over loamy glacial till; on footslopes
- The somewhat poorly drained, calcareous Divide soils, which have gravelly material at a depth of 20 to 40 inches; on high flood plains
- The moderately well drained Embden soils, which contain more sand in the upper part than the Strayhoss and Doland soils and less sand throughout than the Maddock soils; on footslopes
- The somewhat poorly drained, calcareous Hamerly soils on footslopes
- The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on backslopes and footslopes
- The somewhat poorly drained and poorly drained Lamoure soils and the very poorly drained Rauville soils; on low flood plains
- The somewhat poorly drained McIntosh soils, which formed in 24 to 40 inches of loess over loamy glacial till; on footslopes
- The somewhat poorly drained Moritz soils, which formed in loamy alluvium; on high flood plains
- The somewhat poorly drained Spottswood soils, which have gravelly material at a depth of 20 to 40 inches; on high flood plains
- The moderately well drained Svea soils, which formed in loamy glacial till; on footslopes
- The moderately well drained Swenoda soils, which are 20 to 40 inches over glacial till or glaciolacustrine sediments

Use and Management

Major use: About 80 percent cropland
Other uses: About 15 percent pasture and hayland
Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Suited
Management concerns: Strayhoss and Doland—water erosion in areas that have slopes of more than 2 percent; Maddock—wind erosion, water erosion, low available water capacity, and agrochemical leaching

12. Lanona-Swenoda-Maddock Association

Well drained, moderately well drained, and somewhat excessively drained, nearly level, loamy soils on till plains and outwash plains

Composition

Extent of the association in the survey area: Less than 1 percent
Extent of the soils in the association:
Lanona and similar soils—28 percent
Swenoda and similar soils—22 percent
Maddock and similar soils—14 percent
Soils of minor extent—36 percent

Setting

Landform: Till plains and outwash plains
Position on the landform: Lanona—summits and backslopes; Swenoda—footslopes; Maddock—summits, shoulders, and backslopes
Slope range: Lanona—0 to 6 percent; Swenoda—0 to 4 percent; Maddock—0 to 9 percent

Soil Properties and Qualities

Drainage class: Lanona—well drained; Swenoda—moderately well drained; Maddock—somewhat excessively drained
Texture of the surface layer: Sandy loam
Depth to bedrock: Very deep
Depth to contrasting layer: Lanona—20 to 40 inches to glacial till or glaciolacustrine sediments; Swenoda—20 to 40 inches to glacial till or glaciolacustrine sediments; Maddock—more than 60 inches
Depth to water table: Lanona—more than 6 feet; Swenoda—2.5 to 4.0 feet; Maddock—more than 6 feet
Flooding: None
Ponding: None
Permeability: Lanona—moderately rapid in the loamy sediments and moderately slow in the underlying material; Swenoda—moderately rapid in the loamy sediments and moderately slow in the underlying material; Maddock—rapid
Available water capacity: Lanona—moderate; Swenoda—moderate; Maddock—low
Content of organic matter: Lanona—high; Swenoda—high; Maddock—moderately low
Surface runoff: Lanona—low or medium; Swenoda—low or medium; Maddock—very low or low

Minor Soils

- The well drained Allivar soils on high flood plains
- The somewhat poorly drained Badger soils on toeslopes
- The well drained Barnes soils, which formed in loamy glacial till; on summits and backslopes
- The well drained, calcareous Buse soils on shoulders
- The well drained Doland soils, which formed in loamy eolian material 15 to 30 inches thick over loamy glacial till; on summits and backslopes
- The somewhat poorly drained, calcareous McIntosh soils on footslopes

Use and Management

Major use: About 85 percent cropland
Other uses: About 5 percent rangeland and 5 percent pasture and hayland
Main crops: Corn and soybeans
Suitability for crops: Suited
Management concerns: Lanona—wind erosion, water erosion in areas that have slopes of more than 2 percent, moderate available water capacity, and agrochemical leaching; Swenoda—wind erosion, water erosion, moderate available water capacity, and agrochemical leaching; Maddock—wind erosion, water erosion, low available water capacity, and agrochemical leaching

Nearly Level and Gently Sloping, Silty and Loamy Soils on Outwash Plains

These soils make up about 9 percent of the county. Most areas are used for cultivated crops. Water erosion, droughtiness, and agrochemical leaching are important management concerns.

13. Estelline-Brandt Association

Well drained, nearly level and gently sloping, silty soils on outwash plains

Composition

Extent of the association in the survey area: 7 percent
Extent of the soils in the association:
Estelline soils—39 percent
Brandt soils—30 percent
Soils of minor extent—31 percent

Setting

Landform: Outwash plains
Position on the landform: Summits and backslopes
Slope range: 0 to 6 percent

Soil Properties and Qualities

Drainage class: Well drained
Texture of the surface layer: Estelline—silt loam; Brandt—silty clay loam
Depth to bedrock: Very deep
Depth to contrasting layer: Estelline—22 to 40 inches to gravelly material; Brandt—40 to 60 inches to gravelly material
Depth to water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Available water capacity: Estelline—moderate; Brandt—high
Content of organic matter: High
Surface runoff: Low or medium

Minor Soils

- The somewhat poorly drained, calcareous Divide soils on high flood plains
- The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on backslopes and footslopes
- The well drained Kranzburg soils, which formed in silty glacial till over loamy glacial till; on summits and backslopes
- The somewhat poorly drained and poorly drained Lamoure soils on low flood plains
- The somewhat poorly drained, calcareous Moritz soils, which formed in loamy alluvium; on high flood plains
- The very poorly drained Rauville soils on low flood plains
- The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on backslopes
- The excessively drained Sioux soils, which have gravelly material at a depth of 7 to 14 inches; on shoulders
- The poorly drained, calcareous Marysland soils on low flood plains

Use and Management

Major use: About 90 percent cropland
Other uses: About 5 percent pasture and hayland
Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Suited
Management concerns: Estelline—water erosion in areas that have slopes of more than 2 percent, moderate available water capacity, and agrochemical leaching; Brandt—water erosion in areas that have slopes of more than 2 percent

14. Fordville-Renshaw Association

Well drained and somewhat excessively drained, nearly level and gently sloping, loamy soils on outwash plains

Composition

Extent of the association in the survey area: 2 percent
Extent of the soils in the association:
Fordville and similar soils: 55 percent
Renshaw and similar soils: 12 percent
Minor soils: 33 percent

Setting

Landform: Outwash plains
Position on the landform: Fordville—summits, backslopes, and footslopes; Renshaw—backslopes, summits, and shoulders
Slope range: Fordville—mainly 0 to 6 percent (6 to 9 percent in some areas); Renshaw—mainly 2 to 6 percent (6 to 9 percent in some areas)

Soil Properties and Qualities

Drainage class: Fordville—well drained; Renshaw—somewhat excessively drained
Texture of the surface layer: Loam
Depth to bedrock: Very deep
Depth to contrasting layer: Fordville—20 to 40 inches to gravelly material; Renshaw—14 to 20 inches to gravelly material
Depth to water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Fordville—moderate; Renshaw—low
Content of organic matter: Fordville—high; Renshaw—moderate
Surface runoff: Fordville—low or medium; Renshaw—medium

Minor Soils

- The well drained Barnes soils, which formed in loamy glacial till; on summits and backslopes
- The somewhat poorly drained and poorly drained Lamoure soils on low flood plains
- The somewhat poorly drained, calcareous Divide soils, which have gravelly material at a depth of 20 to 40 inches; on high flood plains
- The very poorly drained Rauville soils on low flood plains
- The poorly drained, calcareous Marysland soils, which have gravelly material at a depth of 20 to 40 inches; on low flood plains
- The excessively drained Sioux soils, which have gravelly material at a depth of 7 to 14 inches; on shoulders
- The somewhat poorly drained Spottswood soils, which have gravelly material at a depth of 20 to 40 inches; on high flood plains
- The very poorly drained Southam soils in basins

Use and Management

Major use: About 80 percent cropland
Other uses: About 10 percent rangeland and 5 percent pasture and hayland
Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Suited
Management concerns: Fordville—water erosion in areas that have slopes of more than 2 percent, moderate available water capacity, and agrochemical leaching; Renshaw—water erosion, low available water capacity, and agrochemical leaching

Level and Nearly Level, Loamy, Silty, and Clayey Soils on Flood Plains

These soils formed in alluvium. They make up about 17 percent of the county. Most areas are used for cultivated crops. Flooding, a high water table, wind erosion, a high content of lime, soil compaction, agrochemical leaching, and salinity are the main management concerns.

15. Fordtown-Renwash-Allivar Association

Well drained, nearly level, loamy soils on flood plains (fig. 7)

Composition

Extent of the association in the survey area: 1 percent
Extent of the soils in the association:
Fordtown soils—33 percent
Renwash soils—18 percent
Allivar soils—16 percent
Soils of minor extent—33 percent

Setting

Landform: Flood plains
Position on the landform: High flood plains
Slope range: 0 to 2 percent

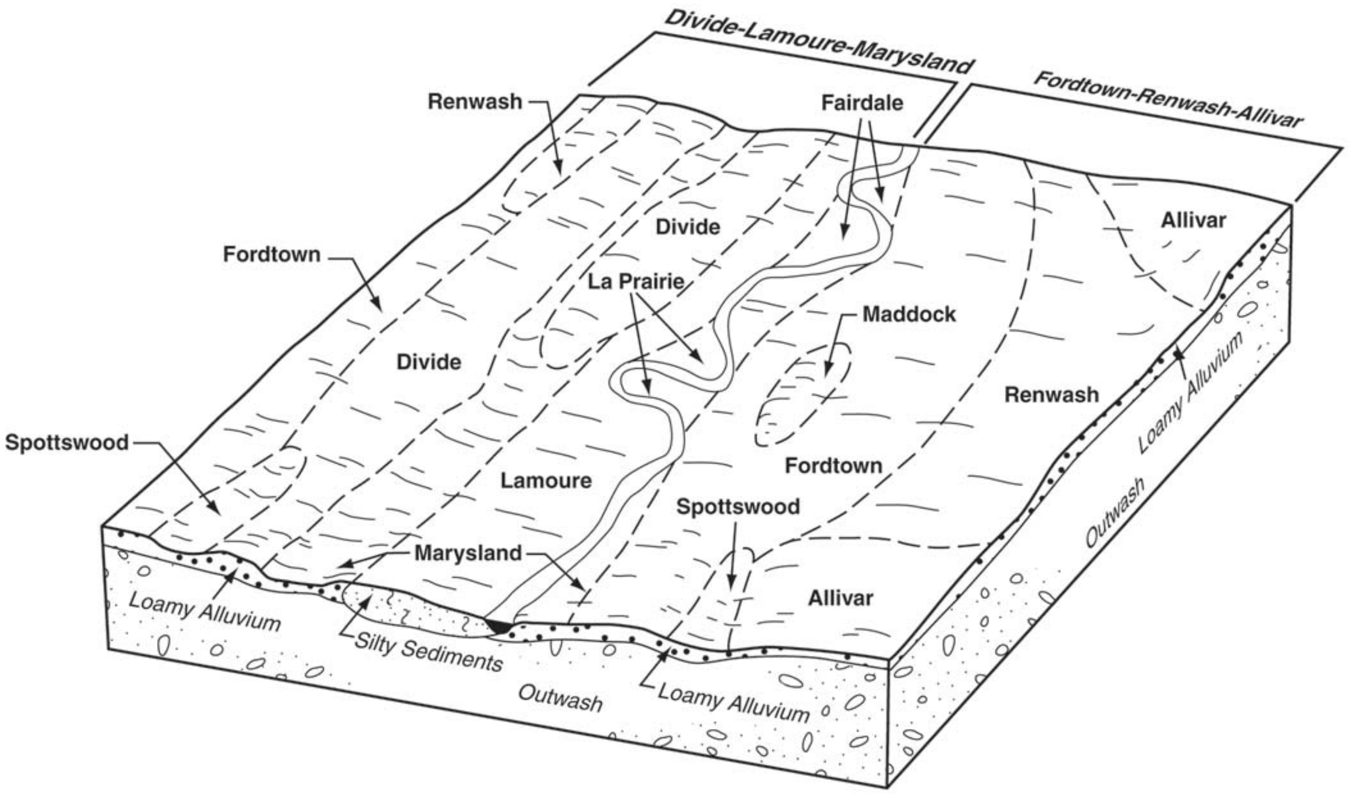

Figure 7.—Typical pattern of soils and parent material in the Fordtown-Renwash-Allivar and Divide-Lamoure-Marysland associations.

Soil Properties and Qualities

Drainage class: Well drained
Texture of the surface layer: Fordtown—loam; Renwash—loam; Allivar—sandy loam
Depth to bedrock: Very deep
Depth to contrasting layer: Fordtown—20 to 40 inches to gravelly material; Renwash—14 to 20 inches to gravelly material; Allivar—14 to 25 inches to gravelly material
Depth to water table: 3.5 to 6.0 feet
Frequency of flooding: Rare
Ponding: None
Permeability: Fordtown—moderate in the loamy sediments and very rapid in the underlying gravelly material; Renwash—moderate in the loamy sediments and very rapid in the underlying gravelly material; Allivar—moderately rapid in the loamy sediments and very rapid in the underlying sandy material
Available water capacity: Fordtown—moderate; Renwash—low; Allivar—low
Content of organic matter: Fordtown—high; Renwash—moderate; Allivar—moderate
Surface runoff: Low

Minor Soils

- The well drained Brandt soils, which formed in silty material 20 to 60 inches thick over gravelly material; on summits and backslopes
- The somewhat poorly drained, calcareous Divide soils, which have gravelly material at a depth of 20 to 40 inches; on high flood plains
- The somewhat poorly drained and poorly drained Lamoure soils and the very poorly drained Rauville soils; on low flood plains
- The somewhat excessively drained Maddock soils, which are sandy throughout; on summits and shoulders on outwash plains
- The poorly drained, calcareous Marysland soils on low flood plains
- The somewhat poorly drained Spottswood soils on high flood plains

Use and Management

Major use: About 80 percent cropland
Other uses: About 15 percent pasture and hayland
Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Suited

Management concerns: Fordtown—moderate available water capacity and agrochemical leaching; Renwash—low available water capacity and agrochemical leaching; Allivar—low available water capacity, wind erosion, and agrochemical leaching

16. Divide-Lamoure-Marysland Association

Somewhat poorly drained and poorly drained, level and nearly level, loamy and silty soils on flood plains (fig. 7)

Composition

Extent of the association in the survey area: 5 percent
Extent of the soils in the association:
Divide and similar soils—33 percent
Lamoure and similar soils—24 percent
Marysland soils—14 percent
Soils of minor extent—29 percent

Setting

Landform: Flood plains
Position on the landform: Divide—high flood plains; Lamoure—low flood plains; Marysland—low flood plains
Slope range: Divide—0 to 2 percent; Lamoure—0 to 1 percent; Marysland—0 to 1 percent

Soil Properties and Qualities

Drainage class: Divide—somewhat poorly drained; Lamoure—somewhat poorly drained and poorly drained; Marysland—poorly drained
Texture of the surface layer: Divide—loam; Lamoure—silty clay loam; Marysland—loam
Depth to bedrock: Very deep
Depth to contrasting layer: Divide—20 to 40 inches to gravelly material; Lamoure—more than 60 inches; Marysland—20 to 40 inches to gravelly material
Water table: Divide—at a depth of 1.5 to 3.5 feet; Lamoure—at the surface to 2 feet below the surface; Marysland—at a depth of 0.5 foot to 1.5 feet
Flooding: Divide—occasional for brief periods; Lamoure—occasional or frequent for brief periods; Marysland—occasional for brief periods
Ponding: None
Permeability: Divide—moderate in the loamy sediments and very rapid in the underlying gravelly material; Lamoure—moderately slow; Marysland—moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Divide—moderate; Lamoure—high; Marysland—moderate
Content of organic matter: Divide—moderate; Lamoure—high; Marysland—moderate
Surface runoff: Divide—low; Lamoure—very low; Marysland—very low

Minor Soils

- The well drained Allivar soils, which have gravelly material at a depth of 14 to 25 inches; on high flood plains
- The moderately well drained Fairdale soils, which formed in channeled, stratified loamy alluvium; on low flood plains
- The well drained Fordtown soils, which have gravelly material at a depth of 20 to 40 inches; on high flood plains
- The moderately well drained La Prairie soils on high flood plains
- The well drained Renwash soils, which have gravelly material at a depth of 14 to 20 inches; on high flood plains
- The somewhat poorly drained Spottswood soils, which have gravelly material at a depth of 20 to 40 inches; on high flood plains

Use and Management

Major use: About 90 percent cropland
Other uses: About 5 percent pasture and hayland
Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Suited
Management concerns: Divide—flooding, high water table, wind erosion, a high content of lime, moderate available water capacity, and agrochemical leaching; Lamoure—flooding, high water table, wind erosion, and a high content of lime; Marysland—flooding, high water table, wind erosion, a high content of lime, agrochemical leaching, and soil compaction

17. Lamoure-Moritz-Divide Association

Somewhat poorly drained and poorly drained, level and nearly level, loamy and silty soils on flood plains

Composition

Extent of the association in the survey area: 8 percent
Extent of the soils in the association:
Lamoure and similar soils—37 percent

Moritz soils—15 percent
Divide soils—10 percent
Soils of minor extent—38 percent

Setting

Landform: Flood plains
Position on the landform: Lamoure—low flood plains; Moritz—high flood plains; Divide—high flood plains
Slope range: Lamoure—0 to 1 percent; Moritz—0 to 2 percent; Divide—0 to 2 percent

Soil Properties and Qualities

Drainage class: Lamoure—somewhat poorly drained and poorly drained; Moritz—somewhat poorly drained; Divide—somewhat poorly drained
Texture of the surface layer: Lamoure—silty clay loam; Moritz—loam; Divide—loam
Depth to bedrock: Very deep
Depth to contrasting layer: Lamoure—more than 60 inches; Moritz—more than 60 inches; Divide—20 to 40 inches to gravelly material
Water table: Lamoure—at the surface to 2 feet below the surface; Moritz—at a depth of 1.5 to 3.0 feet; Divide—at a depth of 1.5 to 3.5 feet
Flooding: Lamoure—occasional or frequent for brief periods; Moritz—occasional for brief periods; Divide—occasional for brief periods
Ponding: None
Permeability: Lamoure—moderately slow; Moritz—moderate; Divide—moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Lamoure—high; Moritz—high; Divide—moderate
Content of organic matter: Lamoure—high; Moritz—high; Divide—moderate
Surface runoff: Lamoure—very low; Moritz—low; Divide—low

Minor Soils

- The well drained Fordtown soils, which have gravelly material at a depth of 20 to 40 inches; on high flood plains
- The well drained, loamy Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on summits, backslopes, and footslopes on outwash plains
- The poorly drained Ludden soils, which formed in clayey alluvium; on low flood plains
- The poorly drained Marysland soils, which have sand and gravel at a depth of 20 to 40 inches; on low flood plains
- The very poorly drained Rauville soils on low flood plains
- The well drained Renwash soils, which have gravelly material at a depth of 14 to 20 inches; on high flood plains
- The well drained, silty Estelline soils, which have gravelly material at a depth of 22 to 40 inches; on summits and backslopes on outwash plains
- The somewhat excessively drained, loamy Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on backslopes on outwash plains

Use and Management

Major use: About 80 percent cropland
Other uses: About 10 percent pasture and hayland and 5 percent rangeland
Main crops: Corn and soybeans
Suitability for crops: Suited
Management concerns: Lamoure—flooding, high water table, wind erosion, and a high content of lime; Moritz—flooding, high water table, wind erosion, and a high content of lime; Divide—flooding, moderate available water capacity, high water table, wind erosion, a high content of lime, and agrochemical leaching

18. Ludden-Lamoure-Rauville Association

Somewhat poorly drained, poorly drained, and very poorly drained, level, clayey and silty soils on flood plains

Composition

Extent of the association in the survey area: 2 percent
Extent of the soils in the association:
Ludden soils—38 percent
Lamoure soils—19 percent
Rauville soils—13 percent
Soils of minor extent—30 percent

Setting

Landform: Flood plains
Position on the landform: Low flood plains
Slope range: 0 to 1 percent

Soil Properties and Qualities

Drainage class: Ludden—poorly drained; Lamoure—

somewhat poorly drained and poorly drained; Rauville—very poorly drained
Texture of the surface layer: Ludden—silty clay; Lamoure—silty clay loam; Rauville—silty clay loam
Depth to bedrock: Very deep
Depth to contrasting layer: Ludden—more than 60 inches; Lamoure—more than 60 inches; Rauville—more than 40 inches
Water table: Ludden—0.5 foot above to 1.5 feet below the surface; Lamoure—at the surface to 2 feet below the surface; Rauville—2.0 feet above to 0.5 foot below the surface
Flooding: Ludden—frequent for long periods; Lamoure—occasional or frequent for brief periods; Rauville—none to frequent for long periods
Ponding: Ludden—none; Lamoure—none; Rauville—none to frequent for long periods
Permeability: Ludden—slow; Lamoure—moderately slow; Rauville—moderately slow
Available water capacity: Ludden—moderate or high; Lamoure—high; Rauville—high
Content of organic matter: High
Surface runoff: Very low

Minor Soils

- The somewhat poorly drained, calcareous Divide soils, which have gravelly material at a depth of 20 to 40 inches; on high flood plains
- The moderately well drained, channeled Fairdale soils, which formed in loamy alluvium; on low flood plains
- The poorly drained Lowe soils, which formed in loamy alluvium; on low flood plains
- The poorly drained, calcareous Marysland soils, which have gravelly material at a depth of 20 to 40 inches; on low flood plains
- The somewhat poorly drained, calcareous Moritz soils, which formed in loamy alluvium; on high flood plains

Use and Management

Major use: About 85 percent cropland
Other uses: About 10 percent pasture and hayland
Main crops: Corn and soybeans
Suitability for crops: Suited
Management concerns: Flooding, high water table, salinity, soil compaction, wind erosion, and a high content of lime

19. Lamo-Clamo-Chaska Association

Somewhat poorly drained and poorly drained, level and nearly level, silty and loamy soils on flood plains

Composition

Extent of the association in the survey area: Less than 1 percent
Extent of the soils in the association:
Lamo soils—34 percent
Clamo soils—17 percent
Chaska soils—12 percent
Soils of minor extent—37 percent

Setting

Landform: Flood plains
Position on the landform: Low flood plains
Slope range: Lamo—0 to 1 percent; Clamo—0 to 1 percent; Chaska—0 to 2 percent

Soil Properties and Qualities

Drainage class: Lamo—somewhat poorly drained; Clamo—poorly drained; Chaska—somewhat poorly drained
Texture of the surface layer: Lamo—loam; Clamo—silty clay loam; Chaska—loam
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to water table: Lamo—1 to 3 feet; Clamo—0.5 foot to 1.5 feet; Chaska—1.5 to 2.5 feet
Flooding: Lamo—occasional for brief periods; Clamo—occasional for long periods; Chaska—frequent for long periods
Ponding: None
Permeability: Lamo—moderately slow; Clamo—slow; Chaska—moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Lamo—very low; Clamo—very low; Chaska—low

Minor Soils

- The poorly drained Arlo soils, which formed in 20 to 40 inches of gravelly material; on low flood plains
- The well drained Davis soils, which formed in loamy alluvium; on high flood plains
- The somewhat poorly drained Dimo soils, which have free carbonates below a depth of 17 inches; on high flood plains
- The well drained Enet soils, which have gravelly

material at a depth of 20 to 40 inches; on high flood plains

Use and Management

Major use: About 75 percent cropland
Other uses: About 10 percent rangeland and 10 percent pasture and hayland
Main crops: Corn and soybeans
Suitability for crops: Suited
Management concerns: Lamo—flooding, high water table, wind erosion, and a high content of lime; Clamo—flooding, high water table, wind erosion, a high content of lime, and soil compaction; Chaska—flooding, high water table, meandering channels, and a high content of lime

Detailed Soil Map Units

The map units delineated on the detailed soil maps in this survey represent the soils in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given under the heading “Use and Management of the Soils.”

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils for which it is named and some “included” areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils are identified by a special symbol on the maps. The included areas of contrasting soils are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series.* Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Barnes clay loam, 0 to 2 percent slopes, is a phase of the Barnes series.

Some map units are made up of two or more major soils. These map units are called complexes. A *complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils are somewhat similar in all areas. Poinsett-Buse-Waubay complex, 1 to 6 percent slopes, is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see Contents) give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Aa—Allivar sandy loam, 0 to 2 percent slopes

Composition

Allivar and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Flood plains
Position on the landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 1,000 acres

Typical Profile

Surface layer:
0 to 6 inches—very dark gray sandy loam

Subsoil:
6 to 15 inches—dark grayish brown sandy loam

Underlying layer:
15 to 50 inches—light brownish gray, calcareous sand; redoximorphic concentrations in the lower part
50 to 80 inches—pale brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 14 to 25 inches to gravelly material
Depth to high water table: 3.5 to 6.0 feet
Frequency of flooding: Rare
Ponding: None
Permeability: Moderately rapid in the loamy sediments and very rapid in the underlying sandy material
Available water capacity: Low
Content of organic matter: Moderate
Surface runoff: Low

Inclusions

Contrasting inclusions:
• Fordtown soils, which have gravelly material at a depth of 20 to 40 inches; on high flood plains
• Maddock soils, which do not have gravelly underlying material; on outwash plains
• Sioux soils, which contain more gravel throughout than the Allivar soil; on shoulders along the flood plains

Similar inclusions:
• Soils that have a surface layer of loam
• Soils that contain more gravel throughout than the Allivar soil
• Soils that are not subject to flooding

Use and Management

Cropland

Main crops: Alfalfa, oats, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: The low available water capacity, wind erosion, and agrochemical leaching
Management considerations:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: 3s
Range site: Shallow to Gravel
Windbreak suitability group: 6G
Pasture suitability group: D2

Ar—Arlo loam, 0 to 1 percent slopes

Composition

Arlo and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains
Position on the landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark gray, calcareous loam

Subsurface layer:
8 to 15 inches—gray, calcareous loam

Subsoil:
15 to 23 inches—gray and grayish brown, calcareous loam
23 to 31 inches—gray and light brownish gray, calcareous loam
31 to 36 inches—light brownish gray and gray, calcareous loam with redoximorphic concentrations

Underlying layer:
36 to 80 inches—light brownish gray, calcareous very gravelly loamy sand, loamy sand, and extremely gravelly loamy sand with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches to gravelly material
High water table: At the surface to 1.5 feet below the surface
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Content of organic matter: Moderate
Surface runoff: Very low
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Dimo soils on high flood plains
• Lamo soils, which do not have gravelly material within a depth of 40 inches; on low flood plains

Similar inclusions:
• Soils that have a surface layer of clay loam

Use and Management

Cropland

Main crops: Corn and soybeans
Suitability for crops: Poorly suited
Management concerns: Flooding, high water table, the high content of lime (which adversely affects the availability of plant nutrients), wind erosion, and agrochemical leaching
Management considerations:
• In wet years this soil is better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth and control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.
• Maintaining existing drainage systems helps to remove excess water.
• Permanent pasture or hayland species should be established.

Interpretive Groups

Land capability classification: 4w
Range site: Subirrigated
Windbreak suitability group: 10
Pasture suitability group: B1

AvB—Arvilla sandy loam, 2 to 6 percent slopes

Composition

Arvilla and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Outwash plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 8 inches—dark gray sandy loam

Subsoil:
8 to 11 inches—dark grayish brown coarse sandy loam
11 to 19 inches—brown coarse sandy loam
19 to 32 inches—pale brown, calcareous gravelly coarse sand

Underlying layer:
32 to 60 inches—pale brown, calcareous gravelly coarse sand

Soil Properties and Qualities

Drainage class: Somewhat excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 14 to 25 inches to gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately rapid in the loamy sediments and very rapid in the underlying sandy material
Available water capacity: Low
Content of organic matter: Moderate
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• The well drained Egeland soils, which do not have gravelly underlying material; on summits and backslopes
• The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on backslopes and footslopes
• Maddock soils, which have less than 2 percent gravel throughout; on summits and backslopes

Similar inclusions:
• Soils that have a surface layer of loam
• Soils that contain more gravel throughout than the Arvilla soil

Use and Management

Cropland and pasture

Main crops: Alfalfa, oats, and spring wheat
Suitability for crops: Poorly suited
Management concerns: The low available water capacity, water erosion, and agrochemical leaching
Management considerations:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.
• Irrigation helps to overcome the limited ability of the soil to store water if an adequate and dependable supply of water is available.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.
• Cultivated areas should be seeded to adapted grasses.

Interpretive Groups

Land capability classification: 4e
Range site: Shallow to Gravel
Windbreak suitability group: 6G
Pasture suitability group: D2

Ba—Badger silty clay loam, 0 to 1 percent slopes

Composition

Badger and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Toeslopes
Slope range: 0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 5 to 400 acres

Typical Profile

Surface soil:
0 to 17 inches—very dark gray silty clay loam

Subsoil:
17 to 34 inches—dark gray silty clay
34 to 42 inches—dark grayish brown silty clay
42 to 58 inches—light brownish gray, calcareous silt loam with redoximorphic concentrations and depletions

Underlying layer:
58 to 60 inches—light brownish gray, calcareous silt loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches to glacial till
High water table: At the surface to 3 feet below the surface
Flooding: Frequent for brief periods
Ponding: None
Permeability: Slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Low

Inclusions

Contrasting inclusions:
• The calcareous Cubden, Hamerly, and McIntosh soils on footslopes
• The very poorly drained Parnell and poorly drained Tonka soils in basins
• The moderately well drained Waubay soils on footslopes

Similar inclusions:
• Soils that have less clay in the upper part than the Badger soil

Use and Management

Cropland

Main crops: Corn and soybeans

Suitability for crops: Well suited
Management concerns: Flooding, high water table, and soil compaction (if the soil is tilled when wet)
Management considerations:
• In wet years this soil is better suited to late-planted crops than to some other crops. Minimizing tillage and leaving crop residue on the surface and including grasses and legumes in the cropping system help to maintain tilth and improve the rate of water infiltration.
• Delaying tillage when the soil is wet helps to prevent soil compaction.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: 2w
Range site: Loamy Overflow
Windbreak suitability group: 2
Pasture suitability group: A

BbA—Barnes clay loam, 0 to 2 percent slopes

Composition

Barnes and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Position on the landform: Summits and backslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 2,000 acres

Typical Profile

Surface layer:
0 to 7 inches—dark gray clay loam

Subsoil:
7 to 12 inches—dark grayish brown clay loam
12 to 18 inches—brown clay loam
18 to 27 inches—pale brown, mottled, calcareous clay loam
27 to 42 inches—light olive brown, mottled, calcareous clay loam

Underlying layer:
42 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Low

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• The somewhat poorly drained Hamerly soils on footslopes
• The moderately well drained Svea soils on footslopes

Similar inclusions:
• Soils that have a surface layer of loam
• Soils that have a surface layer of silt loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 1
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

BbB—Barnes clay loam, 2 to 6 percent slopes

Composition

Barnes and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 2,500 acres

Typical Profile

Surface layer:
0 to 7 inches—dark gray clay loam

Subsoil:
7 to 12 inches—dark grayish brown clay loam
12 to 18 inches—brown clay loam
18 to 27 inches—pale brown, mottled, calcareous clay loam
27 to 42 inches—light olive brown, mottled, calcareous clay loam

Underlying layer:
42 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Medium

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Badger soils on toeslopes
- The calcareous Buse soils on shoulders
- The somewhat poorly drained Hamerly soils on footslopes
- The moderately well drained Svea soils on footslopes

Similar inclusions:
- Soils that have a surface layer of loam
- Soils that have a surface layer of silt loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion
Management considerations:
- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming and grassed waterways help to control water erosion.
- Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 2e
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

BcB—Barnes-Buse loams, 2 to 6 percent slopes

Composition

Barnes and similar soils: 50 to 60 percent
Buse and similar soils: 25 to 35 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Barnes—summits and backslopes; Buse—shoulders
Slope range: Barnes—2 to 6 percent; Buse—3 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Barnes

Surface layer:
0 to 7 inches—dark gray loam

Subsoil:
7 to 12 inches—dark grayish brown loam
12 to 18 inches—brown loam
18 to 27 inches—pale brown, mottled, calcareous loam
27 to 42 inches—light olive brown, mottled, calcareous clay loam

Underlying layer:
42 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Buse

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 32 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
32 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Barnes—high; Buse—moderately low
Surface runoff: Medium
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Hamerly soils on footslopes
• The somewhat excessively drained Renshaw soils on shoulders
• The moderately well drained Svea soils on footslopes

Similar inclusions:
• Soils that have a surface layer of clay loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Barnes—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Barnes—2e; Buse—3e
Range site: Barnes—Silty; Buse—Thin Upland
Windbreak suitability group: Barnes—3; Buse—8
Pasture suitability group: Barnes—F; Buse—G

BeA—Brandt silty clay loam, 0 to 2 percent slopes

Composition

Brandt and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Outwash plains
Position on the landform: Summits and backslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 2,500 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark gray silty clay loam

Subsoil:
9 to 14 inches—dark grayish brown silty clay loam
14 to 26 inches—brown silty clay loam
26 to 35 inches—pale brown silty clay loam
35 to 48 inches—light olive brown, calcareous silty clay loam

Underlying layer:
48 to 60 inches—light olive brown, calcareous gravelly sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 40 to 60 inches to gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Available water capacity: High
Content of organic matter: High
Surface runoff: Low

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• Estelline soils, which have gravelly material at a depth of 20 to 40 inches; on backslopes
• The moderately well drained Goldsmith soils on footslopes
• Poinsett soils, which are not underlain by gravelly material; on backslopes

Similar inclusions:
- Soils that have a surface layer of silt loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
- Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 1
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

BeB—Brandt silty clay loam, 2 to 6 percent slopes

Composition

Brandt and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Outwash plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark gray silty clay loam

Subsoil:
9 to 14 inches—dark grayish brown silty clay loam
14 to 26 inches—brown silty clay loam
26 to 35 inches—pale brown silty clay loam
35 to 48 inches—light olive brown, calcareous silty clay loam

Underlying layer:
48 to 60 inches—light olive brown, calcareous gravelly sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 40 to 60 inches to gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Available water capacity: High
Content of organic matter: High
Surface runoff: Medium

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Badger soils on toeslopes
- Estelline soils, which have gravelly material at a depth of 20 to 40 inches; on backslopes
- The moderately well drained Goldsmith soils on footslopes
- Poinsett soils, which are not underlain by gravelly material; on backslopes

Similar inclusions:
- Soils that have a surface layer of silt loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion
Management considerations:
- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming and grassed waterways help to control water erosion.
- Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 2e
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

Bf—Brookings silty clay loam, 0 to 2 percent slopes

Composition

Brookings and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains

Position on the landform: Footslopes
Slope range: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 5 to 150 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark gray silty clay loam

Subsoil:
9 to 24 inches—very dark gray and dark grayish brown silty clay loam
24 to 30 inches—light olive brown and olive brown silty clay loam with redoximorphic concentrations and depletions
30 to 37 inches—light yellowish brown, calcareous clay loam with redoximorphic concentrations and depletions

Underlying layer:
37 to 80 inches—pale yellow, calcareous clay loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches to loamy glacial till
Depth to high water table: 3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Low
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Badger soils on toeslopes
- The somewhat poorly drained McIntosh soils on footslopes
- The poorly drained Tonka soils in basins

Similar inclusions:
- Soils that are more than 40 inches deep to glacial till
- Soils that have a surface layer of silt loam
- Soils that are less than 20 inches deep to glacial till

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
- Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 1
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

BgC—Buse-Barnes loams, 6 to 9 percent slopes

Composition

Buse and similar soils: 50 to 65 percent
Barnes and similar soils: 25 to 30 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Moraines
Position on the landform: Buse—shoulders; Barnes—backslopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Buse

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 32 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
32 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Barnes

Surface layer:
0 to 7 inches—dark gray loam

Subsoil:
7 to 12 inches—dark grayish brown loam
12 to 18 inches—brown loam

18 to 27 inches—pale brown, mottled, calcareous loam
27 to 42 inches—light olive brown, mottled, calcareous clay loam

Underlying layer:
42 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Buse—moderately low; Barnes—high
Surface runoff: Medium
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• Darnen soils, which are dark to a depth of 20 inches or more; on footslopes
• The somewhat poorly drained Hamerly soils on footslopes
• The somewhat excessively drained Renshaw soils on shoulders

Similar inclusions:
• Areas of Buse soils that have scattered stones on the surface
• Soils that have a surface layer of clay loam

Use and Management

Cropland and pasture

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Poorly suited
Management concerns: Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Barnes—water erosion
Management considerations:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Buse—4e; Barnes—3e
Range site: Buse—Thin Upland; Barnes—Silty
Windbreak suitability group: Buse—8; Barnes—3
Pasture suitability group: Buse—G; Barnes—F

BgD—Buse-Barnes loams, 9 to 20 percent slopes

Composition

Buse and similar soils: 45 to 55 percent
Barnes and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Moraines
Position on the landform: Buse—shoulders; Barnes—backslopes
Slope range: Buse—9 to 20 percent; Barnes—9 to 15 percent
Shape of areas: Irregular
Size of areas: 5 to 350 acres

Typical Profile

Buse

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 32 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
32 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Barnes

Surface layer:
0 to 7 inches—dark gray loam

Subsoil:
7 to 12 inches—dark grayish brown loam
12 to 18 inches—brown loam
18 to 27 inches—pale brown, mottled, calcareous loam
27 to 42 inches—light olive brown, mottled, calcareous clay loam

Underlying layer:
42 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Buse—moderately low; Barnes—high
Surface runoff: High
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
- Darnen soils, which are dark to a depth of 20 inches or more; on footslopes
- The somewhat poorly drained and poorly drained Lamoure soils on low flood plains
- Langhei soils, which have a dark surface layer less than 7 inches thick; on shoulders
- The excessively drained Sioux soils on summits and shoulders

Similar inclusions:
- Areas of Buse soils that have scattered stones on the surface
- Soils that have a surface layer of clay loam

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Barnes—water erosion
Management considerations:
- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Buse—6e; Barnes—4e
Range site: Buse—Thin Upland; Barnes—Silty
Windbreak suitability group: Buse—8; Barnes—3
Pasture suitability group: Buse—G; Barnes—F

BhC—Buse-Barnes loams, 2 to 9 percent slopes, very stony

Composition

Buse and similar soils: 50 to 60 percent
Barnes and similar soils: 30 to 35 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Moraines
Position on the landform: Buse—shoulders; Barnes—backslopes
Slope range: Buse—3 to 9 percent; Barnes—2 to 9 percent
Shape of areas: Irregular
Size of areas: 5 to 10 acres

Typical Profile

Buse

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 32 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
32 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Barnes

Surface layer:
0 to 7 inches—dark gray loam

Subsoil:
7 to 12 inches—dark grayish brown loam
12 to 18 inches—brown loam
18 to 27 inches—pale brown, mottled, calcareous loam
27 to 42 inches—light olive brown, mottled, calcareous clay loam

Underlying layer:
42 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None

Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Buse—moderate; Barnes—high
Surface runoff: Medium
Other properties: Scattered stones and boulders are on the surface in most areas. The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• Darnen soils, which are dark to a depth of 20 inches or more; on footslopes
• The very poorly drained Parnell soils in basins
• The somewhat excessively drained Renshaw soils on shoulders

Similar inclusions:
• Areas where stones have been removed
• Soils that have a surface layer of clay loam

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Buse—wind erosion, water erosion, stoniness, and the high content of lime, which adversely affects the availability of plant nutrients; Barnes—water erosion, stoniness
Management considerations:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Buse—7s; Barnes—7s
Range site: Buse—Thin Upland; Barnes—Silty
Windbreak suitability group: Buse—10; Barnes—10
Pasture suitability group: Buse—NS; Barnes—NS

BhE—Buse-Barnes loams, 9 to 40 percent slopes, very stony

Composition

Buse and similar soils: 60 to 70 percent
Barnes and similar soils: 20 to 25 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Moraines
Position on the landform: Buse—shoulders; Barnes—backslopes
Slope range: Buse—9 to 40 percent; Barnes—9 to 25 percent
Shape of areas: Irregular
Size of areas: 5 to 62 acres

Typical Profile

Buse

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 32 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
32 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Barnes

Surface layer:
0 to 7 inches—dark gray loam

Subsoil:
7 to 12 inches—dark grayish brown loam
12 to 18 inches—brown loam
18 to 27 inches—pale brown, mottled, calcareous loam
27 to 42 inches—light olive brown, mottled, calcareous clay loam

Underlying layer:
42 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Buse—moderate; Barnes—high
Surface runoff: Buse—very high; Barnes—high
Other properties: Scattered stones and boulders are on the surface in most areas. The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• Darnen soils, which are dark to a depth of 20 inches or more; on footslopes
• Langhei soils, which have a dark surface layer less than 7 inches thick; on shoulders

• The excessively drained Sioux soils on summits and shoulders

Similar inclusions:
• Soils that have a surface layer of clay loam

Use and Management

Rangeland

Suitability for crops: Unsuited
Management concerns: Buse—wind erosion, water erosion, stoniness, and the high content of lime, which adversely affects the availability of plant nutrients; Barnes—water erosion, stoniness
Management considerations:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Buse—7s; Barnes—7s
Range site: Buse—Thin Upland; Barnes—Silty
Windbreak suitability group: Buse—10; Barnes—10
Pasture suitability group: Buse—NS; Barnes—NS

BkE—Buse-Lamoure, channeled, complex, 0 to 40 percent slopes

Composition

Buse and similar soils: 60 to 70 percent
Lamoure and similar soils: 20 to 25 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Moraines and flood plains
Position on the landform: Buse—shoulders and backslopes; Lamoure—low flood plains
Slope range: Buse—15 to 40 percent; Lamoure—0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 500 acres

Typical Profile

Buse

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 32 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
32 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Lamoure

Surface soil:
0 to 28 inches—dark gray, calcareous silty clay loam; redoximorphic concentrations in the lower part

Underlying layer:
28 to 57 inches—gray and very dark gray, calcareous silty clay loam
57 to 60 inches—grayish brown, calcareous gravelly loam

Soil Properties and Qualities

Drainage class: Buse—well drained; Lamoure—poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: Buse—at a depth of more than 6 feet; Lamoure—at the surface to 1.5 feet below the surface
Flooding: Buse—none; Lamoure—frequent for brief periods
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Buse—moderately low; Lamoure—high
Surface runoff: Buse—very high; Lamoure—very low
Other properties: Both soils have a high content of lime. Areas of the Lamoure soil typically are dissected by a meandering channel.

Inclusions

Contrasting inclusions:
• Darnen soils, which are dark to a depth of 20 inches or more; on footslopes
• The well drained Langhei soils, which have a dark surface layer less than 7 inches thick; on shoulders
• The very poorly drained Rauville soils on low flood plains
• The excessively drained Sioux soils on summits and shoulders

Similar inclusions:
• Areas of Buse soils that have scattered stones on the surface
• Buse soils that have a surface layer of clay loam
• Soils that are similar to the major Buse soil but are deeper to free carbonates

Use and Management

Rangeland

Management concerns: Buse—wind erosion, water

erosion, the slope, and the high content of lime, which adversely affects the availability of plant nutrients; Lamoure—high water table, meandering channels (which limit cultivation), and the high content of lime, which adversely affects the availability of plant nutrients

Management considerations:

• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Buse—7e; Lamoure—6w
Range site: Buse—Thin Upland; Lamoure—Subirrigated
Windbreak suitability group: Buse—10; Lamoure—2K
Pasture suitability group: Buse—NS; Lamoure—NS

BoE—Buse-Langhei complex, 15 to 40 percent slopes

Composition

Buse and similar soils: 55 to 70 percent
Langhei and similar soils: 20 to 25 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Moraines
Position on the landform: Buse—backslopes; Langhei—shoulders
Slope range: 15 to 40 percent
Shape of areas: Irregular
Size of areas: 5 to 1,250 acres

Typical Profile

Buse

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 32 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
32 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Langhei

Surface layer:
0 to 3 inches—grayish brown, calcareous clay loam

Subsoil:
3 to 10 inches—light olive brown, calcareous clay loam
10 to 14 inches—light olive brown, mottled, calcareous clay loam

Underlying layer:
14 to 80 inches—light olive brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Buse—moderately low; Langhei—low
Surface runoff: Very high
Other properties: Both soils have a high content of lime.

Inclusions

Contrasting inclusions:

• Darnen soils, which are dark to a depth of 20 inches or more; on footslopes
• The somewhat poorly drained and poorly drained Lamoure soils on low flood plains
• The excessively drained Sioux soils on summits and shoulders

Similar inclusions:

• Soils that have scattered stones on the surface
• Buse soils that have a surface layer of clay loam
• Soils that are similar to the major Buse soil but are deeper to free carbonates

Use and Management

Rangeland

Suitability for crops: Unsuited
Management concerns: Wind erosion, water erosion, the slope, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:

• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Buse—7e; Langhei—7e
Range site: Buse—Thin Upland; Langhei—Thin Upland
Windbreak suitability group: Buse—10; Langhei—10
Pasture suitability group: Buse—NS; Langhei—NS

BpD—Buse-Poinsett complex, 9 to 15 percent slopes

Composition

Buse and similar soils: 45 to 55 percent
Poinsett and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Moraines
Position on the landform: Buse—shoulders; Poinsett—backslopes
Slope range: 9 to 15 percent
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Typical Profile

Buse

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 32 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
32 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Poinsett

Surface layer:
0 to 8 inches—dark gray silty clay loam

Subsoil:
8 to 13 inches—dark grayish brown silty clay loam
13 to 23 inches—brown silty clay loam
23 to 46 inches—light brownish gray, mottled, calcareous silty clay loam
46 to 62 inches—light gray, mottled, calcareous silty clay loam

Underlying layer:
62 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Buse—more than 60 inches; Poinsett—more than 40 inches to loamy glacial till
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Buse—moderately slow; Poinsett—moderate
Available water capacity: High
Content of organic matter: Buse—moderately low; Poinsett—high
Surface runoff: High
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The very poorly drained Parnell and poorly drained Tonka soils in basins
• The moderately well drained Waubay soils on footslopes

Similar inclusions:
• Soils that have a thinner surface layer than that of the Buse soil
• Areas of Buse soils that have stones on the surface
• Soils that contain less sand and more silt throughout than the major Buse soil
• Soils that are similar to the Poinsett soil but have glacial till above a depth of 40 inches

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Poinsett—water erosion
Management considerations:
• In many areas that are used as cropland, permanent pasture or hayland species should be established. Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Buse—6e; Poinsett—4e
Range site: Buse—Thin Upland; Poinsett—Silty
Windbreak suitability group: Buse—8; Poinsett—3
Pasture suitability group: Buse—G; Poinsett—F

BrD—Buse, very stony-Poinsett complex, 9 to 25 percent slopes

Composition

Buse and similar soils: 45 to 60 percent
Poinsett and similar soils: 30 to 35 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Moraines
Position on the landform: Buse—shoulders; Poinsett—backslopes
Slope range: Buse—9 to 25 percent; Poinsett—9 to 15 percent
Shape of areas: Irregular
Size of areas: 5 to 600 acres

Typical Profile

Buse

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 32 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
32 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Poinsett

Surface layer:
0 to 8 inches—dark gray silty clay loam

Subsoil:
8 to 13 inches—dark grayish brown silty clay loam
13 to 23 inches—brown silty clay loam
23 to 46 inches—light brownish gray, mottled, calcareous silty clay loam
46 to 62 inches—light gray, mottled, calcareous silty clay loam

Underlying layer:
62 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Buse—more than 60 inches; Poinsett—more than 40 inches to loamy glacial till
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Buse—moderately slow; Poinsett—moderate
Available water capacity: High
Content of organic matter: Buse—moderate; Poinsett—high
Surface runoff: High
Other properties: The Buse soil has a high content of lime. Scattered stones and boulders are on the surface of the Buse soil.

Inclusions

Contrasting inclusions:
- The very poorly drained Parnell and poorly drained Tonka soils in basins
- The moderately well drained Waubay soils on footslopes

Similar inclusions:
- Soils that have a thinner surface layer than that of the Buse soil
- Areas of Buse soils that do not have stones on the surface
- Soils that are similar to the Poinsett soil but have glacial till above a depth of 40 inches

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Buse—wind erosion, water erosion, the high content of lime (which adversely affects the availability of plant nutrients), and stoniness; Poinsett—water erosion
Management considerations:
- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Buse—7s; Poinsett—4e
Range site: Buse—Thin Upland; Poinsett—Silty
Windbreak suitability group: Buse—10; Poinsett—3
Pasture suitability group: Buse—NS; Poinsett—F

BsC—Buse-Singsaas complex, 6 to 9 percent slopes

Composition

Buse and similar soils: 55 to 60 percent
Singsaas and similar soils: 25 to 35 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Moraines
Position on the landform: Buse—shoulders; Singsaas—summits and backslopes
Slope range: 6 to 9 percent

Shape of areas: Irregular
Size of areas: 5 to 250 acres

Typical Profile

Buse

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 32 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
32 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Singsaas

Surface layer:
0 to 9 inches—dark gray silty clay loam

Transitional layer:
9 to 13 inches—dark grayish brown and brown silty clay loam

Subsoil:
13 to 19 inches—brown and dark grayish brown silty clay loam
19 to 32 inches—light yellowish brown, calcareous loam
32 to 41 inches—light yellowish brown, calcareous loam with redoximorphic concentrations and depletions

Underlying layer:
41 to 52 inches—light brownish gray, calcareous loam with redoximorphic concentrations and depletions
52 to 80 inches—light yellowish brown, calcareous loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Buse—more than 60 inches; Singsaas—10 to 20 inches to loamy glacial till
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Buse—moderately low; Singsaas—high
Surface runoff: Medium
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, calcareous Hamerly and McIntosh soils on footslopes
• The moderately well drained Waubay soils on footslopes

Similar inclusions:
• Soils that are deeper to glacial till than the Singsaas soil
• Soils that are similar to the Buse soil but are deeper to free carbonates

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Poorly suited
Management concerns: Singsaas—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Buse—4e; Singsaas—3e
Range site: Buse—Thin Upland; Singsaas—Silty
Windbreak suitability group: Buse—8; Singsaas—3
Pasture suitability group: Buse—G; Singsaas—F

BxE—Buse-Sioux complex, 9 to 40 percent slopes

Composition

Buse and similar soils: 50 to 60 percent
Sioux and similar soils: 30 to 35 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Moraines
Position on the landform: Buse—backslopes; Sioux—shoulders
Slope range: 9 to 40 percent
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Buse

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 32 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
32 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Sioux

Surface layer:
0 to 7 inches—dark gray, calcareous gravelly loam

Transitional layer:
7 to 10 inches—grayish brown, calcareous gravelly loam

Underlying layer:
10 to 60 inches—pale brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Buse—well drained; Sioux—excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Buse—more than 60 inches; Sioux—6 to 14 inches to gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Buse—moderately slow; Sioux—very rapid
Available water capacity: Buse—high; Sioux—very low
Content of organic matter: Moderately low
Surface runoff: Buse—very high; Sioux—medium
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• Darnen soils, which are dark to a depth of 20 inches or more; on footslopes
• Langhei soils, which have a dark surface layer less than 7 inches thick; on shoulders
• Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on summits and shoulders

Similar inclusions:
• Soils that have scattered stones on the surface
• Buse soils that have a surface layer of clay loam
• Soils that are similar to the major Buse soil but are deeper to free carbonates

Use and Management

Rangeland

Suitability for crops: Unsuited
Management concerns: Buse—wind erosion, water erosion, the slope, and the high content of lime, which adversely affects the availability of plant nutrients; Sioux—water erosion, the very low available water capacity, the slope, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Buse—7e; Sioux—7e
Range site: Buse—Thin Upland; Sioux—Very Shallow
Windbreak suitability group: Buse—10; Sioux—10
Pasture suitability group: Buse—NS; Sioux—NS

Ca—Castlewood silty clay, 0 to 1 percent slopes

Composition

Castlewood and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Flood plains
Position on the landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 75 acres

Typical Profile

Surface soil:
0 to 12 inches—very dark gray silty clay

Subsoil:
12 to 30 inches—very dark gray clay

30 to 46 inches—gray, calcareous clay with redoximorphic concentrations

Underlying layer:
46 to 60 inches—light gray, calcareous silty clay loam with redoximorphic concentrations and depletions
60 to 80 inches—light gray, calcareous clay loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: At the surface to 1.5 feet below the surface
Flooding: Occasional for long periods
Ponding: None
Permeability: Slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Very low

Inclusions

Contrasting inclusions:
• The moderately well drained LaDelle soils on high flood plains
• The calcareous Lamoure soils on low flood plains
• The somewhat poorly drained Spottswood soils on high flood plains

Similar inclusions:
• Soils that are calcareous above a depth of 15 inches
• Soils that have a surface layer of silty clay loam

Use and Management

Cropland

Main crops: Corn and soybeans
Suitability for crops: Poorly suited
Management concerns: Flooding, high water table, wind erosion, soil compaction (if the soil is tilled when wet), and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• In wet years this soil is better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth, prevent soil compaction, and control erosion.
• Rotations that include grasses and legumes help to maintain the content of organic matter, fertility, and tilth.
• Maintaining existing drainage systems helps to remove excess water.
• Permanent pasture or hayland species should be established.

Interpretive Groups

Land capability classification: 4w
Range site: Wetland
Windbreak suitability group: 10
Pasture suitability group: B1

Ch—Chaska loam, channeled

Composition

Chaska and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Flood plains
Position on the landform: Low flood plains
Slope range: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 5 to 200 acres

Typical Profile

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Underlying layer:
7 to 14 inches—dark gray, calcareous, stratified loam and fine sandy loam
14 to 60 inches—dark gray and light brownish gray, calcareous, stratified loam and fine sandy loam with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: 1.5 to 2.5 feet
Flooding: Frequent for long periods
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Low
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The well drained Davis soils on high flood plains
• Lamo soils, which have less sand and more silt in

the subsoil than the Chaska soil; on low flood plains

Similar inclusions:
- Soils that have a surface layer of silt loam

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Flooding, high water table, meandering channels (which limit cultivation), and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
- Proper grazing management helps to maintain plant vigor and control streambank erosion.

Interpretive Groups

Land capability classification: 6w
Range site: Subirrigated
Windbreak suitability group: 1K
Pasture suitability group: NS

Cm—Clamo silty clay, 0 to 1 percent slopes

Composition

Clamo and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Flood plains
Position on the landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

Surface soil:
0 to 13 inches—very dark gray silty clay

Subsoil:
13 to 27 inches—very dark gray silty clay
27 to 39 inches—dark gray, calcareous silty clay
39 to 60 inches—gray, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: 0.5 foot to 1.5 feet
Flooding: Occasional for long periods
Ponding: None
Permeability: Slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Very low

Inclusions

Contrasting inclusions:
- The well drained Davis soils on high flood plains
- The somewhat poorly drained, calcareous Lamo soils on low flood plains
- The somewhat poorly drained Dimo soils on high flood plains

Similar inclusions:
- Soils that have a surface layer of silty clay loam

Use and Management

Cropland and pasture

Main crops: Corn and soybeans
Suitability for crops: Poorly suited
Management concerns: Flooding, high water table, the high content of lime (which adversely affects the availability of plant nutrients), wind erosion, and soil compaction (if the soil is tilled when wet)
Management considerations:
- In wet years this soil is better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth, prevent soil compaction, and control erosion.
- Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
- Maintaining existing drainage systems helps to remove excess water.
- Permanent pasture or hayland species should be established.

Interpretive Groups

Land capability classification: 4w
Range site: Clayey Overflow
Windbreak suitability group: 10
Pasture suitability group: B1

Co—Cubden-Badger silty clay loams, 0 to 2 percent slopes

Composition

Cubden and similar soils: 55 to 65 percent
Badger and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Cubden—footslopes; Badger—toeslopes
Slope range: Cubden—0 to 2 percent; Badger—0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 5 to 200 acres

Typical Profile

Cubden

Surface layer:
0 to 10 inches—gray, calcareous silty clay loam

Transitional layer:
10 to 15 inches—gray, calcareous silty clay loam

Subsoil:
15 to 26 inches—pale brown, calcareous silty clay loam
26 to 33 inches—light yellowish brown, calcareous silty clay loam

Underlying layer:
33 to 48 inches—light yellowish brown, calcareous silt loam with redoximorphic concentrations and depletions
48 to 60 inches—pale yellow, calcareous clay loam with redoximorphic concentrations and depletions

Badger

Surface soil:
0 to 17 inches—very dark gray silty clay loam

Subsoil:
17 to 34 inches—dark gray silty clay
34 to 42 inches—dark grayish brown silty clay
42 to 58 inches—light brownish gray, calcareous silt loam with redoximorphic concentrations and depletions

Underlying layer:
58 to 60 inches—light brownish gray, calcareous silt loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Cubden—more than 40 inches to loamy glacial till; Badger—more than 40 inches to glacial till
High water table: Cubden—at a depth of 1.5 to 3.5 feet; Badger—at the surface to 3 feet below the surface
Flooding: Cubden—none; Badger—frequent for brief periods
Ponding: None
Permeability: Cubden—moderately slow; Badger—slow
Available water capacity: High
Content of organic matter: Cubden—moderate; Badger—high
Surface runoff: Low
Other properties: The Cubden soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The very poorly drained Parnell and poorly drained Tonka soils in basins
• The moderately well drained Waubay soils on footslopes

Similar inclusions:
• Soils that are similar to the Cubden soil but have glacial till above a depth of 40 inches
• Soils that are similar to the Badger soil but have less clay in the upper part

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Cubden—high water table, the high content of lime (which adversely affects the availability of plant nutrients), and wind erosion; Badger—flooding, high water table, and soil compaction (if the soil is tilled when wet)
Management considerations:
• In wet years these soils are better suited to late-planted crops than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Deferring tillage when the Badger soil is wet helps to prevent soil compaction.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: Cubden—2s; Badger—2w
Range site: Cubden—Limy Subirrigated; Badger—Loamy Overflow
Windbreak suitability group: Cubden—1K; Badger—2
Pasture suitability group: Cubden—F; Badger—A

Ct—Cubden-Tonka silty clay loams, 0 to 2 percent slopes

Composition

Cubden and similar soils: 45 to 55 percent
Tonka and similar soils: 35 to 40 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Cubden—footslopes; Tonka—basins
Slope range: Cubden—0 to 2 percent; Tonka—0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 5 to 100 acres

Typical Profile

Cubden

Surface layer:
0 to 10 inches—gray, calcareous silty clay loam

Transitional layer:
10 to 15 inches—gray, calcareous silty clay loam

Subsoil:
15 to 26 inches—pale brown, calcareous silty clay loam
26 to 33 inches—light yellowish brown, calcareous silty clay loam

Underlying layer:
33 to 48 inches—light yellowish brown, calcareous silt loam with redoximorphic concentrations and depletions
48 to 60 inches—pale yellow, calcareous clay loam with redoximorphic concentrations and depletions

Tonka

Surface layer:
0 to 13 inches—dark gray silty clay loam

Subsurface layer:
13 to 24 inches—gray silty clay loam

Subsoil:
24 to 30 inches—grayish brown silty clay loam with redoximorphic concentrations
30 to 40 inches—light brownish gray silty clay with redoximorphic concentrations

Underlying layer:
40 to 49 inches—light gray silty clay loam with redoximorphic concentrations
49 to 60 inches—light gray clay loam with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Cubden—somewhat poorly drained; Tonka—poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Cubden—more than 40 inches to loamy glacial till; Tonka—more than 60 inches
High water table: Cubden—at a depth of 1.5 to 3.5 feet; Tonka—1 foot above to 1.5 feet below the surface
Flooding: None
Ponding: Cubden—none; Tonka—occasional for long periods
Permeability: Cubden—moderately slow; Tonka—slow
Available water capacity: High
Content of organic matter: Cubden—moderate; Tonka—high
Surface runoff: Cubden—low; Tonka—negligible
Other properties: The Cubden soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils, which do not have carbonates above a depth of 35 inches; on toeslopes
• The very poorly drained Parnell soils in basins

Similar inclusions:
• Soils that have a surface layer of silt loam

Use and Management

Cropland

Main crops: Corn and soybeans
Suitability for crops: Well suited
Management concerns: Cubden—high water table, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Tonka—ponding, high water table
Management considerations:
• In most years these soils are better suited to late-planted crops than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Maintaining existing drainage systems helps to remove excess water.
• Deferring tillage when the Tonka soil is wet helps to prevent soil compaction.
• Permanent pasture or hayland species should be established in areas of the Tonka soil.

Interpretive Groups

Land capability classification: Cubden—2s; Tonka—4w
Range site: Cubden—Limy Subirrigated; Tonka—Wet Meadow
Windbreak suitability group: Cubden—1K; Tonka—10
Pasture suitability group: Cubden—F; Tonka—B2

DaB—Darnen loam, 2 to 6 percent slopes

Composition

Darnen and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Footslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 75 acres

Typical Profile

Surface soil:
0 to 29 inches—very dark gray loam

Subsoil:
29 to 46 inches—grayish brown loam
46 to 69 inches—pale brown, calcareous loam
69 to 80 inches—pale brown, mottled, calcareous silt loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Medium
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- Egeland soils, which have more sand and less silt and clay than the Darnen soil; on backslopes
- The moderately well drained Embden soils on footslopes

Similar inclusions:
- Soils that have free carbonates closer to the surface than those in the Darnen soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion
Management considerations:
- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming and grassed waterways help to control water erosion.
- Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 2e
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

DcA—Davis loam, 0 to 2 percent slopes

Composition

Davis and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Flood plains
Position on the landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface soil:
0 to 12 inches—very dark gray loam

Subsoil:
12 to 21 inches—very dark gray loam
21 to 32 inches—very dark grayish brown fine sandy loam
32 to 48 inches—brown and grayish brown sandy loam and loam
48 to 60 inches—dark grayish brown, calcareous loam

Soil Properties and Qualities

Drainage class: Moderately well drained

Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: 3 to 5 feet
Frequency of flooding: Rare
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Low
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The poorly drained Clamo and somewhat poorly drained Lamo soils on low flood plains
- Enet soils, which have gravelly material at a depth of 20 to 40 inches; on high flood plains

Similar inclusions:
- Soils that are calcareous within a depth of 20 inches
- Soils that have a surface soil of silt loam
- Soils that have sandy material below a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
- Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 1
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

DcB—Davis loam, 2 to 6 percent slopes

Composition

Davis and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Position on the landform: Footslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Surface soil:
0 to 12 inches—very dark gray loam

Subsoil:
12 to 21 inches—very dark gray loam
21 to 32 inches—very dark grayish brown fine sandy loam
32 to 48 inches—brown and grayish brown sandy loam and loam
48 to 60 inches—dark grayish brown, calcareous loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Medium
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- Clarno soils, which have free carbonates closer to the surface than those in the Davis soil; on backslopes
- The somewhat poorly drained Dimo soils on low flood plains

Similar inclusions:
- Soils that have a surface layer of silt loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion
Management considerations:
- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming and grassed waterways help to control water erosion.
- Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 2e
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

Dm—Dimo clay loam, 0 to 2 percent slopes

Composition

Dimo and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains
Position on the landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 1,000 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark gray clay loam

Subsoil:
8 to 18 inches—dark gray loam
18 to 31 inches—grayish brown loam with redoximorphic concentrations and depletions

Underlying layer:
31 to 42 inches—light brownish gray, calcareous very gravelly sand
42 to 60 inches—grayish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches to gravelly material
Depth to high water table: 1.5 to 3.0 feet
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Content of organic matter: High
Surface runoff: Low

Inclusions

Contrasting inclusions:
- The poorly drained Arlo soils on low flood plains
- The poorly drained Clamo soils, which do not have gravelly underlying material; on low flood plains
- The well drained Enet soils on high flood plains
- Lamo soils, which do not have gravelly material above a depth of 40 inches; on low flood plains

Similar inclusions:
- Soils that are calcareous to the surface
- Soils that have a surface layer of loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Moderate available water capacity, flooding, high water table, and agrochemical leaching
Management considerations:
- In wet years or after a flood, this soil is better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth and minimize surface compaction.
- In dry years this soil is better suited to early maturing crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
- Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: 2w
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

Dn—Divide loam, 0 to 2 percent slopes

Composition

Divide and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Flood plains
Position on the landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 1,000 acres

Typical Profile

Surface layer:
0 to 7 inches—very dark gray, calcareous loam

Subsurface layer:
7 to 13 inches—dark gray, calcareous loam

Subsoil:
13 to 19 inches—gray, calcareous loam
19 to 26 inches—light yellowish brown, calcareous loam with redoximorphic concentrations

Underlying layer:
26 to 31 inches—light olive brown, calcareous gravelly loamy sand
31 to 60 inches—light brownish gray, calcareous very gravelly loamy coarse sand

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches to gravelly material
Depth to high water table: 1.5 to 3.5 feet
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Content of organic matter: Moderate
Surface runoff: Low
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
- The poorly drained Castlewood and Marysland soils on low flood plains
- The well drained Fordtown soils, which have gravelly material at a depth of 20 to 40 inches; on high flood plains
- The well drained Renwash soils, which have gravelly material at a depth of 14 to 20 inches; on high flood plains

Similar inclusions:
- Areas that are not flooded
- Soils that are not calcareous at the surface

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Flooding, high water table, the high content of lime (which adversely affects the availability of plant nutrients), the moderate available water capacity, wind erosion, and agrochemical leaching
Management considerations:
- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
- Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: 3w
Range site: Limy Subirrigated
Windbreak suitability group: 1K
Pasture suitability group: D1

DoB—Doland loam, 2 to 6 percent slopes

Composition

Doland and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 600 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark gray loam

Subsoil:
8 to 21 inches—brown loam
21 to 30 inches—light olive brown, calcareous clay loam
30 to 39 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
39 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 15 to 30 inches to loamy glacial till
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High

Content of organic matter: High
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• The moderately well drained Brookings and Svea soils on footslopes
• The somewhat poorly drained Hamerly soils on footslopes
• Strayhoss soils, which do not have glacial till above a depth of 40 inches; on summits and backslopes

Similar inclusions:
• Soils that have less sand and more silt in the subsoil than the Doland soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion
Management considerations:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 2e
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

DsA—Doland-Svea loams, 0 to 2 percent slopes

Composition

Doland and similar soils: 55 to 60 percent
Svea and similar soils: 25 to 35 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Doland—summits and backslopes; Svea—footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 500 acres

Typical Profile

Doland

Surface layer:
0 to 8 inches—very dark gray loam

Subsoil:
8 to 21 inches—brown loam
21 to 30 inches—light olive brown, calcareous clay loam
30 to 39 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
39 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Svea

Surface layer:
0 to 10 inches—very dark gray loam

Subsoil:
10 to 18 inches—very dark grayish brown loam
18 to 28 inches—yellowish brown loam
28 to 36 inches—light yellowish brown, calcareous clay loam

Underlying layer:
36 to 80 inches—light yellowish brown, calcareous clay loam with redoximorphic depletions

Soil Properties and Qualities

Drainage class: Doland—well drained; Svea—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Doland—15 to 30 inches to loamy glacial till; Svea—more than 60 inches
Depth to high water table: Doland—more than 6 feet; Svea—3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Low
Other properties: Runoff water flows over the Svea soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes

• The somewhat poorly drained, calcareous Hamerly soils on footslopes
• Strayhoss soils, which have sand at a depth of 20 to 40 inches; on summits and backslopes

Similar inclusions:
• Soils that have less sand and more silt in the upper part
• Soils that are similar to the Doland soil but have glacial till to the surface

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Doland—1; Svea—1
Range site: Doland—Silty; Svea—Loamy Overflow
Windbreak suitability group: Doland—3; Svea—1
Pasture suitability group: Doland—F; Svea—K

EaB—Egan-Ethan complex, 2 to 6 percent slopes

Composition

Egan and similar soils: 55 to 65 percent
Ethan and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Egan—backslopes; Ethan—summits and shoulders
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 350 acres

Typical Profile

Egan

Surface layer:
0 to 10 inches—very dark gray silty clay loam

Subsoil:
10 to 24 inches—brown silty clay loam
24 to 35 inches—light olive brown, calcareous clay loam
35 to 44 inches—light olive brown, mottled, calcareous clay loam
44 to 57 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
57 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Ethan

Surface layer:
0 to 8 inches—very dark gray, calcareous loam

Subsoil:
8 to 16 inches—light olive brown, calcareous loam
16 to 55 inches—light yellowish brown, calcareous clay loam

Underlying layer:
55 to 80 inches—light yellowish brown, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Egan—24 to 40 inches to loamy glacial till; Ethan—more than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Egan—high; Ethan—moderately low
Surface runoff: Medium
Other properties: The Ethan soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Chancellor soils on toeslopes
• The moderately well drained Trent soils on footslopes
• The moderately well drained Wakonda soils, which are calcareous within a depth of 16 inches; on footslopes
• The very poorly drained Worthing soils in basins

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat

Suitability for crops: Well suited
Management concerns: Egan—water erosion; Ethan—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Egan—2e; Ethan—3e
Range site: Egan—Silty; Ethan—Thin Upland
Windbreak suitability group: Egan—3; Ethan—8
Pasture suitability group: Egan—F; Ethan—G

EeB—Egan-Wentworth-Trent silty clay loams, 1 to 6 percent slopes

Composition

Egan and similar soils: 30 to 40 percent
Wentworth and similar soils: 25 to 30 percent
Trent and similar soils: 20 to 25 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Egan—summits and backslopes; Wentworth—backslopes; Trent—footslopes
Slope range: Egan—2 to 6 percent; Wentworth—2 to 6 percent; Trent—1 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Egan

Surface layer:
0 to 10 inches—very dark gray silty clay loam

Subsoil:
10 to 24 inches—brown silty clay loam
24 to 35 inches—light olive brown, calcareous clay loam
35 to 44 inches—light olive brown, mottled, calcareous clay loam
44 to 57 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
57 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Wentworth

Surface layer:
0 to 8 inches—very dark gray silty clay loam

Subsoil:
8 to 18 inches—dark grayish brown silty clay loam
18 to 27 inches—brown silty clay loam
27 to 37 inches—light yellowish brown, calcareous silt loam
37 to 48 inches—pale yellow, mottled, calcareous silt loam

Underlying layer:
48 to 60 inches—pale yellow, mottled, calcareous silt loam

Trent

Surface soil:
0 to 13 inches—very dark gray silty clay loam

Subsoil:
13 to 20 inches—very dark gray silty clay loam
20 to 25 inches—very dark grayish brown silty clay loam
25 to 35 inches—grayish brown silty clay loam with redoximorphic concentrations and depletions
35 to 46 inches—pale yellow, calcareous silty clay loam with redoximorphic concentrations and depletions

Underlying layer:
46 to 60 inches—pale yellow, calcareous silt loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Egan—well drained; Wentworth—well drained; Trent—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Egan—24 to 40 inches to loamy glacial till; Wentworth—more than 40 inches to loamy glacial till; Trent—more than 40 inches to loamy glacial till
Depth to high water table: Egan—more than 6 feet; Wentworth—more than 6 feet; Trent—3.5 to 5.0 feet
Flooding: None

Ponding: None
Permeability: Egan—moderately slow; Wentworth—moderate; Trent—moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Egan—medium; Wentworth—medium; Trent—low
Other properties: Runoff water flows over the Trent soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Chancellor soils on toeslopes
- The calcareous Ethan soils on shoulders
- The moderately well drained Wakonda soils, which are calcareous within a depth of 16 inches; on footslopes
- The very poorly drained Worthing soils in basins

Similar inclusions:
- Soils that contain more sand and less silt
- Soils that have a surface layer of silt loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Egan and Wentworth—water erosion; Trent—few limitations
Management considerations:
- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming and grassed waterways help to control water erosion.
- Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Egan—2e; Wentworth—2e; Trent—1
Range site: Egan—Silty; Wentworth—Silty; Trent—Loamy Overflow
Windbreak suitability group: Egan—3; Wentworth—3; Trent—1
Pasture suitability group: Egan—F; Wentworth—F; Trent—K

EgA—Egeland-Embden complex, 0 to 2 percent slopes

Composition

Egeland and similar soils: 45 to 50 percent
Embden and similar soils: 40 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Position on the landform: Egeland—summits; Embden—footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Egeland

Surface layer:
0 to 8 inches—dark gray sandy loam

Subsoil:
8 to 14 inches—brown sandy loam
14 to 30 inches—light yellowish brown, calcareous sandy loam

Underlying layer:
30 to 80 inches—light yellowish brown, calcareous loamy sand

Embden

Surface soil:
0 to 16 inches—very dark grayish brown fine sandy loam

Subsoil:
16 to 29 inches—brown fine sandy loam
29 to 34 inches—pale brown, calcareous loamy fine sand

Underlying layer:
34 to 38 inches—pale brown, calcareous fine sandy loam with redoximorphic concentrations
38 to 80 inches—pale brown, calcareous loamy sand with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Egeland—well drained; Embden—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches

Depth to high water table: Egeland—more than 6 feet; Embden—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderately rapid
Available water capacity: Moderate
Content of organic matter: Egeland—moderately low; Embden—high
Surface runoff: Low
Other properties: Runoff water flows over the Embden soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• Allivar soils, which have gravelly material at a depth of 14 to 25 inches; on high flood plains
• The somewhat excessively drained Maddock soils on summits
• Renwash soils, which have gravelly material at a depth of 14 to 20 inches; on high flood plains

Similar inclusions:
• Soils that have glacial till below a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, oats, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Wind erosion, the moderate available water capacity, and agrochemical leaching
Management considerations:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: Egeland—2s; Embden—2s
Range site: Egeland—Sandy; Embden—Sandy
Windbreak suitability group: Egeland—5; Embden—1
Pasture suitability group: Egeland—H; Embden—H

EgB—Egeland-Embden complex, 2 to 6 percent slopes

Composition

Egeland and similar soils: 50 to 65 percent
Embden and similar soils: 25 to 30 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Outwash plains
Position on the landform: Egeland—summits and backslopes; Embden—footslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 75 acres

Typical Profile

Egeland

Surface layer:
0 to 8 inches—dark gray sandy loam

Subsoil:
8 to 14 inches—brown sandy loam
14 to 30 inches—light yellowish brown, calcareous sandy loam

Underlying layer:
30 to 80 inches—light yellowish brown, calcareous loamy sand

Embden

Surface soil:
0 to 16 inches—very dark grayish brown fine sandy loam

Subsoil:
16 to 29 inches—brown fine sandy loam
29 to 34 inches—pale brown, calcareous loamy fine sand

Underlying layer:
34 to 38 inches—pale brown, calcareous fine sandy loam with redoximorphic concentrations
38 to 80 inches—pale brown, calcareous loamy sand with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Egeland—well drained; Embden—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches

Depth to high water table: Egeland—more than 6 feet; Embden—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderately rapid
Available water capacity: Moderate
Content of organic matter: Egeland—moderately low; Embden—high
Surface runoff: Medium
Other properties: Runoff water flows over the Embden soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Arvilla soils on shoulders
- The somewhat excessively drained Maddock soils on summits

Similar inclusions:
- Soils that have glacial till below a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, oats, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Wind erosion, water erosion, the moderate available water capacity, and agrochemical leaching
Management considerations:
- These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface help to control erosion and maintain the content of organic matter.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.
- Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: Egeland—3e; Embden—3e
Range site: Egeland—Sandy; Embden—Sandy
Windbreak suitability group: Egeland—5; Embden—1
Pasture suitability group: Egeland—H; Embden—H

EnA—Enet loam, 0 to 2 percent slopes, rarely flooded

Composition

Enet and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains
Position on the landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark gray loam

Subsoil:
8 to 22 inches—very dark gray loam
22 to 26 inches—dark grayish brown sandy loam

Underlying layer:
26 to 42 inches—light yellowish brown, calcareous, stratified very gravelly sand and gravelly sand
42 to 60 inches—brown, calcareous, stratified very gravelly sand and gravelly sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches to gravelly material
Depth to high water table: 3.5 to 6.0 feet
Frequency of flooding: Rare
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Low
Content of organic matter: High
Surface runoff: Low

Inclusions

Contrasting inclusions:
- Davis soils, which do not have gravelly material above a depth of 40 inches; on high flood plains
- The somewhat poorly drained Dimo soils on high flood plains

Similar inclusions:
- Soils that contain more silt and less sand in the upper part than the Enet soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: The low available water capacity and agrochemical leaching
Management considerations:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.
• Irrigation helps to overcome the limited ability of the soil to store water if an adequate and dependable supply of water is available.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: 2s
Range site: Silty
Windbreak suitability group: 6G
Pasture suitability group: D1

EsA—Estelline silt loam, 0 to 2 percent slopes

Composition

Estelline and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Outwash plains
Position on the landform: Summits and backslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 2,000 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark gray silt loam

Subsoil:
9 to 20 inches—dark grayish brown silty clay loam
20 to 34 inches—brown silty clay loam
34 to 37 inches—light yellowish brown, calcareous silty clay loam

Underlying layer:
37 to 50 inches—pale brown, calcareous gravelly sand
50 to 60 inches—very pale brown, calcareous gravelly sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 22 to 40 inches to gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Content of organic matter: High
Surface runoff: Low

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• The moderately well drained Brookings and Goldsmith soils on footslopes
• Kranzburg and Strayhoss soils, which are not underlain by gravelly material; on backslopes

Similar inclusions:
• Soils that contain more sand and less silt in the upper part than the Estelline soil
• Soils that are deeper to gravelly material than the Estelline soil
• Soils that have a surface layer of silty clay loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: The moderate available water capacity and agrochemical leaching
Management considerations:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
• Rotations that include grasses and legumes help to maintain the content of organic matter and tilth.
• Irrigation helps to overcome the limited ability of the

soil to store water if an adequate and dependable supply of water is available.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: 2s
Range site: Silty
Windbreak suitability group: 6G
Pasture suitability group: D1

EsB—Estelline silt loam, 2 to 6 percent slopes

Composition

Estelline and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Outwash plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 250 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark gray silt loam

Subsoil:
9 to 20 inches—dark grayish brown silty clay loam
20 to 34 inches—brown silty clay loam
34 to 37 inches—light yellowish brown, calcareous silty clay loam

Underlying layer:
37 to 50 inches—pale brown, calcareous gravelly sand
50 to 60 inches—very pale brown, calcareous gravelly sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 22 to 40 inches to gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Content of organic matter: High
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• The moderately well drained Goldsmith soils on footslopes
• Kranzburg and Strayhoss soils, which are not underlain by gravelly material; on backslopes
• The somewhat excessively drained Renshaw soils on backslopes

Similar inclusions:
• Soils that contain more sand and less silt in the upper part than the Estelline soil
• Soils that are deeper to gravelly material than the Estelline soil
• Soils that have a surface layer of silty clay loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion, the moderate available water capacity, and agrochemical leaching
Management considerations:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming and grassed waterways help to control water erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.
• Irrigation helps to overcome the limited ability of the soil to store water if an adequate and dependable supply of water is available.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: 3e
Range site: Silty
Windbreak suitability group: 6G
Pasture suitability group: D1

EtB—Estelline-Sioux complex, 2 to 6 percent slopes

Composition

Estelline and similar soils: 55 to 65 percent
Sioux and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Outwash plains
Position on the landform: Estelline—backslopes; Sioux—summits and shoulders
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 125 acres

Typical Profile

Estelline

Surface layer:
0 to 9 inches—very dark gray silt loam

Subsoil:
9 to 20 inches—dark grayish brown silty clay loam
20 to 34 inches—brown silty clay loam
34 to 37 inches—light yellowish brown, calcareous silty clay loam

Underlying layer:
37 to 50 inches—pale brown, calcareous gravelly sand
50 to 60 inches—very pale brown, calcareous gravelly sand

Sioux

Surface layer:
0 to 7 inches—dark gray, calcareous gravelly loam

Transitional layer:
7 to 10 inches—grayish brown, calcareous gravelly loam

Underlying layer:
10 to 60 inches—pale brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Estelline—well drained; Sioux—excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Estelline—22 to 40 inches to gravelly material; Sioux—6 to 14 inches to gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Estelline—moderate in the silty sediments and very rapid in the underlying gravelly material; Sioux—very rapid
Available water capacity: Estelline—moderate; Sioux—very low
Content of organic matter: Estelline—high; Sioux—moderately low
Surface runoff: Estelline—medium; Sioux—very low

Inclusions

Contrasting inclusions:
• The moderately well drained Goldsmith soils on footslopes

Similar inclusions:
• Soils that are similar to the Estelline soil but have more sand and less silt in the subsoil
• Soils that are deeper to gravelly material

Use and Management

Cropland

Main crops: Alfalfa, oats, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Estelline—water erosion, the moderate available water capacity, and agrochemical leaching; Sioux—water erosion, the very low available water capacity, agrochemical leaching, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming and grassed waterways help to control water erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.
• Irrigation helps to overcome the limited ability of the soils to store water if an adequate and dependable supply of water is available.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: Estelline—3e; Sioux—6s
Range site: Estelline—Silty; Sioux—Very Shallow
Windbreak suitability group: Estelline—6G; Sioux—10
Pasture suitability group: Estelline—D1; Sioux—NS

EvD—Ethan-Clarno loams, 9 to 15 percent slopes

Composition

Ethan and similar soils: 50 to 60 percent
Clarno and similar soils: 25 to 35 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Moraines
Position on the landform: Ethan—shoulders; Clarno—backslopes
Slope range: 9 to 15 percent
Shape of areas: Irregular
Size of areas: 5 to 70 acres

Typical Profile

Ethan

Surface layer:
0 to 8 inches—very dark gray, calcareous loam

Subsoil:
8 to 16 inches—light olive brown, calcareous loam
16 to 55 inches—light yellowish brown, calcareous clay loam

Underlying layer:
55 to 80 inches—light yellowish brown, calcareous clay loam

Clarno

Surface layer:
0 to 8 inches—very dark gray loam

Subsoil:
8 to 15 inches—brown loam
15 to 24 inches—light olive brown, calcareous clay loam
24 to 47 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
47 to 60 inches—pale yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Ethan—moderately low; Clarno—high
Surface runoff: High
Other properties: The Ethan soil has a high content of lime.

Inclusions

Contrasting inclusions:
- Davis soils, which are dark to a depth of 20 inches or more; on high flood plains
- The poorly drained Lamo soils on low flood plains

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Ethan—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Clarno—water erosion
Management considerations:
- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Ethan—6e; Clarno—4e
Range site: Ethan—Thin Upland; Clarno—Silty
Windbreak suitability group: Ethan—8; Clarno—3
Pasture suitability group: Ethan—G; Clarno—F

EwC—Ethan-Egan complex, 6 to 9 percent slopes

Composition

Ethan and similar soils: 45 to 50 percent
Egan and similar soils: 40 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines and till plains
Position on the landform: Ethan—shoulders; Egan—backslopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Ethan

Surface layer:
0 to 8 inches—very dark gray, calcareous loam

Subsoil:
8 to 16 inches—light olive brown, calcareous loam

16 to 55 inches—light yellowish brown, calcareous clay loam

Underlying layer:
55 to 80 inches—light yellowish brown, calcareous clay loam

Egan

Surface layer:
0 to 10 inches—very dark gray silty clay loam

Subsoil:
10 to 24 inches—brown silty clay loam
24 to 35 inches—light olive brown, calcareous clay loam
35 to 44 inches—light olive brown, mottled, calcareous clay loam
44 to 57 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
57 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Ethan—more than 60 inches; Egan—24 to 40 inches to loamy glacial till
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Ethan—moderately low; Egan—high
Surface runoff: Medium
Other properties: The Ethan soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Chancellor soils on toeslopes
• The moderately well drained Wakonda soils on footslopes
• The very poorly drained Worthing soils in basins

Use and Management

Cropland and pasture

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Poorly suited
Management concerns: Ethan—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Egan—water erosion
Management considerations:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Ethan—4e; Egan—3e
Range site: Ethan—Thin Upland; Egan—Silty
Windbreak suitability group: Ethan—8; Egan—3
Pasture suitability group: Ethan—G; Egan—F

Fa—Fairdale loam, channeled

Composition

Fairdale and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Flood plains
Position on the landform: Low flood plains
Slope range: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 5 to 2,500 acres

Typical Profile

Surface layer:
0 to 6 inches—dark gray, calcareous loam

Underlying layer:
6 to 38 inches—gray, dark gray, light gray, and dark grayish brown, calcareous, stratified loam, sandy loam, silty clay loam, and silt loam
38 to 60 inches—light gray, dark gray, and gray, calcareous, stratified fine sand, silt loam, sand, and loam with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches

Depth to high water table: 3 to 5 feet
Flooding: Frequent for brief periods
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Low
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained and poorly drained Lamoure soils and the very poorly drained Rauville soils; on low flood plains

Similar inclusions:
• Soils that do not have stratification within a depth of 10 inches
• Soils that have a surface layer of silt loam

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Flooding and the meandering channels, which limit cultivation (fig. 8)
Management considerations:
• Proper grazing management helps to maintain plant vigor and control streambank erosion.

Interpretive Groups

Land capability classification: 6w
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: NS

Fb—Fordtown loam, 0 to 2 percent slopes

Composition

Fordtown and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Flood plains
Position on the landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 800 acres

Typical Profile

Surface soil:
0 to 13 inches—very dark gray loam

Subsoil:
13 to 21 inches—dark gray loam
21 to 29 inches—light olive brown loam

Underlying layer:
29 to 63 inches—light yellowish brown and pale brown, calcareous very gravelly sand
63 to 80 inches—pale yellow, calcareous sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches to gravelly material
Depth to high water table: 3.5 to 6.0 feet
Frequency of flooding: Rare
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Content of organic matter: High
Surface runoff: Low

Inclusions

Contrasting inclusions:
• Allivar soils, which have less gravel within a depth of 40 inches than the Fordtown soil; on high flood plains
• The somewhat poorly drained, calcareous Divide soils on high flood plains
• The somewhat poorly drained Spottswood soils on high flood plains
• Renwash soils, which have gravelly material at a depth of less than 20 inches; on high flood plains

Similar inclusions:
• Soils that are not subject to flooding
• Soils that have more silt and less sand in the upper part than the Fordtown soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: The moderate available water capacity and agrochemical leaching
Management considerations:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
• Rotations that include grasses and legumes help to maintain the content of organic matter and tilth.

Figure 8.—An area of Fairdale loam, channeled.

- Irrigation helps to overcome the limited ability of the soil to store water if an adequate and dependable supply of water is available.
- Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: 2s
Range site: Silty
Windbreak suitability group: 6G
Pasture suitability group: D1

Fc—Fordtown-Spottswood loams, 0 to 2 percent slopes

Composition

Fordtown and similar soils: 50 to 60 percent
Spottswood and similar soils: 30 to 35 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Flood plains
Position on the landform: High flood plains
Slope range: 0 to 2 percent

Shape of areas: Irregular
Size of areas: 5 to 500 acres

Typical Profile

Fordtown

Surface soil:
0 to 13 inches—very dark gray loam

Subsoil:
13 to 21 inches—dark gray loam
21 to 29 inches—light olive brown loam

Underlying layer:
29 to 63 inches—light yellowish brown and pale brown, calcareous very gravelly sand
63 to 80 inches—pale yellow, calcareous sand

Spottswood

Surface layer:
0 to 10 inches—very dark gray loam

Subsoil:
10 to 17 inches—very dark gray loam
17 to 22 inches—light olive brown sandy loam
22 to 26 inches—light olive brown, calcareous sandy loam with redoximorphic concentrations

Underlying layer:
26 to 80 inches—light brownish gray, calcareous gravelly sand with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Fordtown—well drained; Spottswood—somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches to gravelly material
Depth to high water table: Fordtown—3.5 to 6.0 feet; Spottswood—1.5 to 3.0 feet
Flooding: Fordtown—rare; Spottswood—occasional for brief periods
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Content of organic matter: High
Surface runoff: Low

Inclusions

Contrasting inclusions:
- Allivar soils, which contain less gravel and more sand within a depth of 40 inches than the major soils; on high flood plains
- Divide soils, which have free carbonates within a depth of 16 inches; on high flood plains
- Renwash soils, which have gravelly material at a depth of 14 to 20 inches; on high flood plains

Similar inclusions:
- Soils that are similar to the Spottswood soil but are moderately well drained
- Soils that are not subject to flooding

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Fordtown—the moderate available water capacity and agrochemical leaching; Spottswood—flooding, high water table, the moderate available water capacity, and agrochemical leaching
Management considerations:
- In general, these soils are better suited to early maturing crops, such as small grain, than to some other crops, except in areas of the Spottswood soil when the high water table is accessible by late-planted crops or after a flood. Minimizing tillage and leaving crop residue on the surface conserve moisture.
- Rotations that include grasses and legumes help to maintain the content of organic matter and tilth.
- Irrigation helps to overcome the limited ability of the soils to store water if an adequate and dependable supply of water is available.

Interpretive Groups

Land capability classification: Fordtown—2s; Spottswood—2w
Range site: Fordtown—Silty; Spottswood—Loamy Overflow
Windbreak suitability group: Fordtown—6G; Spottswood—1
Pasture suitability group: Fordtown—D1; Spottswood—K

FdA—Fordville loam, 0 to 2 percent slopes

Composition

Fordville and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Position on the landform: Summits and backslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 1,000 acres

Typical Profile

Surface layer:
0 to 7 inches—very dark gray loam

Subsoil:
7 to 17 inches—dark gray loam
17 to 27 inches—brown loam

Underlying layer:
27 to 33 inches—grayish brown, calcareous gravelly loamy sand
33 to 60 inches—light yellowish brown, calcareous sand and gravelly sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches to gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Content of organic matter: High
Surface runoff: Low

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, calcareous Divide soils on nearby high flood plains
• The somewhat poorly drained Spottswood soils on nearby high flood plains
• Renwash soils, which have gravelly material at a depth of 14 to 20 inches; on nearby high flood plains

Similar inclusions:
• Soils that have more silt and less sand in the upper part than the Fordville soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: The moderate available water capacity and agrochemical leaching
Management considerations:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
• Rotations that include grasses and legumes help to maintain the content of organic matter and tilth.
• Irrigation helps to overcome the limited ability of the soil to store water if an adequate and dependable supply of water is available.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: 2s
Range site: Silty
Windbreak suitability group: 6G
Pasture suitability group: D1

FrB—Fordville-Renshaw loams, 2 to 6 percent slopes

Composition

Fordville and similar soils: 60 to 65 percent
Renshaw and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Outwash plains
Position on the landform: Fordville—backslopes and footslopes; Renshaw—summits and shoulders
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Fordville

Surface layer:
0 to 7 inches—very dark gray loam

Subsoil:
7 to 17 inches—dark gray loam
17 to 27 inches—brown loam

Underlying layer:
27 to 33 inches—grayish brown, calcareous gravelly loamy sand
33 to 60 inches—light yellowish brown, calcareous sand and gravelly sand

Renshaw

Surface layer:
0 to 7 inches—very dark gray loam

Subsoil:
7 to 12 inches—dark grayish brown loam
12 to 18 inches—brown loam

Underlying layer:
18 to 24 inches—brown, calcareous gravelly loamy sand

24 to 60 inches—brown, calcareous very gravelly loamy sand

Soil Properties and Qualities

Drainage class: Fordville—well drained; Renshaw—somewhat excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Fordville—20 to 40 inches to gravelly material; Renshaw—14 to 20 inches to gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Fordville—moderate; Renshaw—low
Content of organic matter: Fordville—high; Renshaw—moderate
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• Arvilla soils, which have more sand and less clay and silt in the subsoil than the major soils; on summits and backslopes
• The excessively drained Sioux soils on summits and shoulders

Similar inclusions:
• Soils that have more silt and less sand in the upper part
• Soils that are similar to the Renshaw soil but have a surface layer of gravelly loam

Use and Management

Cropland

Main crops: Alfalfa, oats, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Fordville—water erosion, the moderate available water capacity, and agrochemical leaching; Renshaw—water erosion, the low available water capacity, and agrochemical leaching
Management considerations:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming and grassed waterways help to control water erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: Fordville—3e; Renshaw—4e
Range site: Fordville—Silty; Renshaw—Shallow to Gravel
Windbreak suitability group: Fordville—6G; Renshaw—6G
Pasture suitability group: Fordville—D1; Renshaw—D2

Gs—Goldsmith silty clay loam, 0 to 2 percent slopes

Composition

Goldsmith and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Outwash plains
Position on the landform: Footslopes
Slope range: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 5 to 60 acres

Typical Profile

Surface soil:
0 to 23 inches—very dark gray silty clay loam

Subsoil:
23 to 33 inches—dark grayish brown silty clay loam
33 to 48 inches—light yellowish brown silt loam with redoximorphic concentrations and depletions
48 to 59 inches—light yellowish brown, calcareous gravelly loam with redoximorphic concentrations and depletions

Underlying layer:
59 to 66 inches—light yellowish brown, calcareous gravelly loamy sand with redoximorphic concentrations
66 to 80 inches—light yellowish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 40 to 60 inches to gravelly material
Depth to high water table: 3 to 5 feet

Flooding: None
Ponding: None
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Available water capacity: High
Content of organic matter: High
Surface runoff: Low
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Badger soils on toeslopes
- The somewhat poorly drained Cubden soils on footslopes
- The poorly drained Tonka soils in basins

Similar inclusions:
- Soils that have a surface layer of silt loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
- Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 1
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

Hb—Hamerly-Badger complex, 0 to 2 percent slopes

Composition

Hamerly and similar soils: 55 to 65 percent
Badger and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Hamerly—footslopes; Badger—toeslopes
Slope range: Hamerly—0 to 2 percent; Badger—0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 5 to 250 acres

Typical Profile

Hamerly

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 13 inches—gray, calcareous loam
13 to 31 inches—light brownish gray, calcareous loam

Underlying layer:
31 to 42 inches—light yellowish brown, calcareous clay loam with redoximorphic concentrations
42 to 80 inches—light yellowish brown, calcareous clay loam with redoximorphic concentrations and depletions

Badger

Surface soil:
0 to 17 inches—very dark gray silty clay loam

Subsoil:
17 to 34 inches—dark gray silty clay
34 to 42 inches—dark grayish brown silty clay
42 to 58 inches—light brownish gray, calcareous silt loam with redoximorphic concentrations and depletions

Underlying layer:
58 to 60 inches—light brownish gray, calcareous silt loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Hamerly—more than 60 inches; Badger—more than 40 inches to glacial till
High water table: Hamerly—at a depth of 1.5 to 3.5 feet; Badger—at the surface to 3 feet below the surface
Flooding: Hamerly—none; Badger—frequent for brief periods
Ponding: None
Permeability: Hamerly—moderately slow; Badger—slow
Available water capacity: High
Content of organic matter: Hamerly—moderate; Badger—high
Surface runoff: Low
Other properties: The Hamerly soil has a high content of lime.

Inclusions

Contrasting inclusions:
- The moderately well drained Cavour soils, which have a sodium-affected subsoil; on footslopes
- The very poorly drained Parnell and poorly drained Tonka soils in basins
- The moderately well drained Svea soils on footslopes

Similar inclusions:
- Soils that are similar to the Hamerly soil but have less sand and more silt
- Soils that are similar to the Badger soil but have less clay in the upper part

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Hamerly—high water table, the high content of lime (which adversely affects the availability of plant nutrients), and wind erosion; Badger—flooding, high water table, and soil compaction (if the soil is tilled when wet)
Management considerations:
- In wet years these soils are better suited to late-planted crops than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
- Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
- Deferring tillage when the Badger soil is wet helps to prevent soil compaction.
- Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: Hamerly—2s; Badger—2w
Range site: Hamerly—Limy Subirrigated; Badger—Loamy Overflow
Windbreak suitability group: Hamerly—1K; Badger—2
Pasture suitability group: Hamerly—F; Badger—A

Hc—Hamerly-Cavour-Badger complex, 0 to 2 percent slopes

Composition

Hamerly and similar soils: 40 to 45 percent
Cavour and similar soils: 25 to 30 percent
Badger and similar soils: 15 to 20 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Hamerly—footslopes; Cavour—footslopes; Badger—toeslopes
Slope range: Hamerly—0 to 2 percent; Cavour—0 to 1 percent; Badger—0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Hamerly

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 13 inches—gray, calcareous loam
13 to 31 inches—light brownish gray, calcareous loam

Underlying layer:
31 to 42 inches—light yellowish brown, calcareous clay loam with redoximorphic concentrations
42 to 80 inches—light yellowish brown, calcareous clay loam with redoximorphic concentrations and depletions

Cavour

Surface layer:
0 to 7 inches—dark gray clay loam

Subsoil:
7 to 13 inches—dark gray, calcareous clay loam
13 to 30 inches—light olive brown, calcareous clay loam
30 to 44 inches—light yellowish brown, calcareous clay loam with redoximorphic concentrations

Underlying layer:
44 to 80 inches—light yellowish brown, calcareous clay loam with redoximorphic concentrations

Badger

Surface soil:
0 to 17 inches—very dark gray silty clay loam

Subsoil:
17 to 34 inches—dark gray silty clay
34 to 42 inches—dark grayish brown silty clay
42 to 58 inches—light brownish gray, calcareous silt loam with redoximorphic concentrations and depletions

Underlying layer:
58 to 60 inches—light brownish gray, calcareous

silt loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Hamerly—somewhat poorly drained; Cavour—moderately well drained; Badger—somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Hamerly—more than 60 inches; Cavour—more than 60 inches; Badger—more than 40 inches to glacial till
High water table: Hamerly—at a depth of 1.5 to 3.5 feet; Cavour—at a depth of 3.5 to 5.0 feet; Badger—at the surface to 3 feet below the surface
Flooding: Hamerly—none; Cavour—none; Badger—frequent for brief periods
Ponding: None
Permeability: Hamerly—moderately slow; Cavour—very slow; Badger—slow
Available water capacity: High
Content of organic matter: Hamerly—moderate; Cavour—high; Badger—high
Surface runoff: Low
Other properties: The Hamerly soil has a high content of lime. The Cavour soil has a sodium-affected subsoil.

Inclusions

Contrasting inclusions:
• The very poorly drained Parnell and poorly drained Tonka soils in basins
• The moderately well drained Svea soils, which do not have a sodium-affected subsoil; on footslopes

Similar inclusions:
• Soils that are similar to the Hamerly soil but have less sand and more silt
• Soils that are similar to the Badger soil but have less clay in the upper part

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Hamerly—high water table, the high content of lime (which adversely affects the availability of plant nutrients), and wind erosion; Cavour—the high sodium content; Badger—flooding, high water table, and soil compaction (if the soil is tilled when wet)
Management considerations:
• In wet years these soils are better suited to late-planted crops than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Chiseling or subsoiling when the Cavour soil is dry increases the rate of water infiltration.
• Deferring tillage when the Badger soil is wet helps to prevent surface compaction.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: Hamerly—2s; Cavour—4s; Badger—2w
Range site: Hamerly—Limy Subirrigated; Cavour—Claypan; Badger—Loamy Overflow
Windbreak suitability group: Hamerly—1K; Cavour—9L; Badger—2
Pasture suitability group: Hamerly—F; Cavour—C; Badger—A

HeA—Hetland silty clay loam, 0 to 2 percent slopes

Composition

Hetland and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Ice-walled lake plains
Position on the landform: Summits
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark gray silty clay loam

Subsoil:
8 to 21 inches—dark grayish brown silty clay
21 to 24 inches—grayish brown silty clay
24 to 42 inches—light brownish gray, mottled, calcareous silty clay loam

Underlying layer:
42 to 60 inches—light brownish gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep

Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Low

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, calcareous Cubden soils on footslopes
• Poinsett soils, which have more silt and less clay throughout than the Hetland soil; on backslopes
• The poorly drained Tonka soils in basins
• The moderately well drained Waubay soils on footslopes

Similar inclusions:
• Soils that have a surface layer of silty clay

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 1
Range site: Silty
Windbreak suitability group: 4
Pasture suitability group: F

HeB—Hetland silty clay loam, 2 to 6 percent slopes

Composition

Hetland and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Ice-walled lake plains
Position on the landform: Summits
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 120 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark gray silty clay loam

Subsoil:
8 to 21 inches—dark grayish brown silty clay
21 to 24 inches—grayish brown silty clay
24 to 42 inches—light brownish gray, mottled, calcareous silty clay loam

Underlying layer:
42 to 60 inches—light brownish gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• The calcareous Buse soils on shoulders
• The somewhat poorly drained Cubden and moderately well drained Waubay soils on footslopes
• Poinsett soils, which have less clay and more silt throughout than the Hetland soil; on backslopes
• The poorly drained Tonka soils in basins

Similar inclusions:
• Soils that have a surface layer of silty clay

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion
Management considerations:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming and grassed waterways help to control water erosion.

• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 2e
Range site: Silty
Windbreak suitability group: 4
Pasture suitability group: F

KrA—Kranzburg-Brookings silty clay loams, 0 to 2 percent slopes

Composition

Kranzburg and similar soils: 55 to 60 percent
Brookings and similar soils: 25 to 35 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Kranzburg—summits and backslopes; Brookings—footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 1,000 acres

Typical Profile

Kranzburg

Surface layer:
0 to 9 inches—very dark gray silty clay loam

Subsoil:
9 to 18 inches—grayish brown silty clay loam
18 to 25 inches—light olive brown silty clay loam
25 to 29 inches—grayish brown, calcareous clay loam
29 to 57 inches—light yellowish brown, calcareous clay loam that is mottled in the lower part

Underlying layer:
57 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Brookings

Surface layer:
0 to 9 inches—very dark gray silty clay loam

Subsoil:
9 to 24 inches—very dark gray and dark grayish brown silty clay loam
24 to 30 inches—light olive brown and olive brown silty clay loam with redoximorphic concentrations and depletions
30 to 37 inches—light yellowish brown, calcareous clay loam

Underlying layer:
37 to 80 inches—pale yellow, calcareous clay loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Kranzburg—well drained; Brookings—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches to loamy glacial till
Depth to high water table: Kranzburg—more than 6 feet; Brookings—3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Low
Other properties: Runoff water flows over the Brookings soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• Estelline soils, which have gravelly material at a depth of 20 to 40 inches; on summits and backslopes
• The somewhat poorly drained McIntosh soils on footslopes
• The very poorly drained Parnell and poorly drained Tonka soils in basins

Similar inclusions:
• Soils that are more than 40 inches deep to glacial till
• Soils that have a surface layer of silt loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Kranzburg—1; Brookings—1
Range site: Kranzburg—Silty; Brookings—Loamy Overflow

Windbreak suitability group: Kranzburg—3; Brookings—1
Pasture suitability group: Kranzburg—F; Brookings—K

KrB—Kranzburg-Brookings silty clay loams, 1 to 6 percent slopes

Composition

Kranzburg and similar soils: 55 to 70 percent
Brookings and similar soils: 20 to 25 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Kranzburg—summits and backslopes; Brookings—footslopes
Slope range: Kranzburg—2 to 6 percent; Brookings—1 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 3,000 acres

Typical Profile

Kranzburg

Surface layer:
0 to 9 inches—very dark gray silty clay loam

Subsoil:
9 to 18 inches—grayish brown silty clay loam
18 to 25 inches—light olive brown silty clay loam
25 to 29 inches—grayish brown, calcareous clay loam
29 to 57 inches—light yellowish brown, calcareous clay loam that is mottled in the lower part

Underlying layer:
57 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Brookings

Surface layer:
0 to 9 inches—very dark gray silty clay loam

Subsoil:
9 to 24 inches—very dark gray and dark grayish brown silty clay loam
24 to 30 inches—light olive brown and olive brown silty clay loam with redoximorphic concentrations and depletions
30 to 37 inches—light yellowish brown, calcareous clay loam with redoximorphic concentrations and depletions

Underlying layer:
37 to 80 inches—pale yellow, calcareous clay loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Kranzburg—well drained; Brookings—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches to loamy glacial till
Depth to high water table: Kranzburg—more than 6 feet; Brookings—3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Kranzburg—medium; Brookings—low
Other properties: Runoff water flows over the Brookings soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Badger soils on toeslopes
- Estelline soils, which have gravelly material at a depth of 20 to 40 inches; on summits and backslopes
- The somewhat poorly drained McIntosh soils on footslopes
- The very poorly drained Parnell and poorly drained Tonka soils in basins

Similar inclusions:
- Soils that are more than 40 inches deep to glacial till
- Soils that have a surface layer of silt loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Kranzburg—water erosion; Brookings—few limitations
Management considerations:
- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming (fig. 9) and grassed waterways help to control water erosion.
- Rotations that include grasses and legumes help to

Figure 9.—Terraces and contour farming in an area of Kranzburg-Brookings silty clay loams, 1 to 6 percent slopes.

control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Kranzburg—2e; Brookings—1
Range site: Kranzburg—Silty; Brookings—Loamy Overflow
Windbreak suitability group: Kranzburg—3; Brookings—1
Pasture suitability group: Kranzburg—F; Brookings—K

La—La Prairie loam, 0 to 2 percent slopes, occasionally flooded

Composition

La Prairie and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Flood plains
Position on the landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface soil:
0 to 14 inches—dark gray loam

Subsoil:
14 to 22 inches—grayish brown loam
22 to 39 inches—brown loam
39 to 55 inches—light yellowish brown, calcareous silt loam with redoximorphic depletions
55 to 80 inches—light yellowish brown, calcareous silt loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: 3.5 to 5.0 feet
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Low

Inclusions

Contrasting inclusions:
• The well drained Fordtown soils on high flood plains
• The somewhat poorly drained and poorly drained Lamoure soils on low flood plains
• The very poorly drained Rauville soils on low flood plains

Similar inclusions:
• Soils that are stratified in the upper 10 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Flooding
Management considerations:
• In wet years this soil is better suited to late-planted crops than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.

Interpretive Groups

Land capability classification: 2w
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

Lc—La Prairie loam, 0 to 2 percent slopes, rarely flooded

Composition

La Prairie and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Flood plains
Position on the landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface soil:
0 to 14 inches—dark gray loam

Subsoil:
14 to 22 inches—grayish brown loam
22 to 39 inches—brown loam
39 to 55 inches—light yellowish brown, calcareous silt loam with redoximorphic depletions
55 to 80 inches—light yellowish brown, calcareous silt loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: 3.5 to 5.0 feet
Frequency of flooding: Rare
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Low

Inclusions

Contrasting inclusions:
• The poorly drained Castlewood soils on low flood plains
• The well drained Fordtown soils on high flood plains
• The somewhat poorly drained and poorly drained Lamoure soils on low flood plains
• The somewhat poorly drained Moritz soils on high flood plains

Similar inclusions:
• Soils that contain more silt and less sand throughout than the La Prairie soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 1
Range site: Silty
Windbreak suitability group: 1
Pasture suitability group: K

Ld—LaDelle silt loam, 0 to 2 percent slopes

Composition

LaDelle and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Flood plains
Position on the landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark gray silt loam

Subsurface layer:
8 to 20 inches—dark gray silt loam

Subsoil:
20 to 30 inches—dark grayish brown silt loam
30 to 38 inches—dark grayish brown silty clay loam
38 to 44 inches—light olive brown silty clay loam with redoximorphic concentrations
44 to 64 inches—light olive brown and light yellowish brown, calcareous silty clay loam (redoximorphic concentrations in the upper part and redoximorphic depletions in the lower part)
64 to 80 inches—light yellowish brown, calcareous silt loam with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: 3.5 to 5.0 feet
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Low

Inclusions

Contrasting inclusions:
- The poorly drained Castlewood soils on low flood plains
- The somewhat poorly drained and poorly drained Lamoure soils on low flood plains
- The somewhat poorly drained Moritz soils on low flood plains

Similar inclusions:
- Soils that contain more sand and less clay throughout than the LaDelle soil
- Soils that have a surface layer of loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
- Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 2w
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

Le—Lamo silty clay loam, 0 to 1 percent slopes

Composition

Lamo and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains
Position on the landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Surface layer:
0 to 10 inches—very dark gray, calcareous silty clay loam

Subsurface layer:
10 to 16 inches—dark gray, calcareous silty clay loam

Subsoil:
16 to 29 inches—gray, calcareous silty clay loam with redoximorphic concentrations
29 to 40 inches—gray, calcareous silty clay loam with redoximorphic concentrations and depletions

Underlying layer:
40 to 54 inches—light olive gray, calcareous silt loam with redoximorphic concentrations and depletions
54 to 60 inches—light olive gray, calcareous, stratified silt loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: 1 to 3 feet
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Very low
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The poorly drained Clamo soils on low flood plains

Similar inclusions:
• Soils that have gravelly material between depths of 40 and 60 inches

Use and Management

Cropland

Main crops: Corn and soybeans
Suitability for crops: Fairly well suited
Management concerns: Flooding, high water table, the high content of lime (which adversely affects the availability of plant nutrients), and wind erosion
Management considerations:
• In wet years this soil is better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth, prevent soil compaction, and control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: 3w
Range site: Subirrigated
Windbreak suitability group: 2K
Pasture suitability group: A

Lk—Lamoure silty clay loam, 0 to 1 percent slopes

Composition

Lamoure and similar soils: 70 to 95 percent
Contrasting inclusions: 5 to 30 percent

Setting

Landform: Flood plains
Position on the landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 700 acres

Typical Profile

Surface soil:
0 to 28 inches—dark gray, calcareous silty clay loam

Underlying layer:
28 to 57 inches—gray and very dark gray, calcareous silty clay loam
57 to 60 inches—grayish brown, calcareous gravelly loam

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: At the surface to 2 feet below the surface
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Very low
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained LaDelle soils on high flood plains
• Ludden soils, which have more clay and less sand in the subsoil than the Lamoure soil; on low flood plains

• The very poorly drained Rauville soils on low flood plains

Similar inclusions:
• Soils that have gravelly material below a depth of 40 inches
• Soils that have a surface layer of silt loam

Use and Management

Cropland

Main crops: Corn and soybeans
Suitability for crops: Fairly well suited
Management concerns: Flooding, high water table, the high content of lime (which adversely affects the availability of plant nutrients), and wind erosion
Management considerations:
• In wet years this soil is better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth, prevent soil compaction, and control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: 3w
Range site: Subirrigated
Windbreak suitability group: 2K
Pasture suitability group: A

Lm—Lamoure-Rauville silty clay loams, channeled

Composition

Lamoure and similar soils: 60 to 70 percent
Rauville and similar soils: 20 to 25 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Flood plains
Position on the landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 5 to 2,500 acres

Typical Profile

Lamoure

Surface soil:
0 to 28 inches—dark gray, calcareous silty clay loam (redoximorphic concentrations in the lower part)

Underlying layer:
28 to 57 inches—gray and very dark gray, calcareous silty clay loam
57 to 60 inches—grayish brown, calcareous gravelly loam

Rauville

Surface layer:
0 to 10 inches—very dark gray, calcareous silty clay loam

Subsurface layer:
10 to 24 inches—very dark gray, calcareous silty clay loam with redoximorphic concentrations

Underlying layer:
24 to 48 inches—olive gray and light olive gray silty clay loam with redoximorphic concentrations
48 to 60 inches—grayish brown coarse sand

Soil Properties and Qualities

Drainage class: Lamoure—poorly drained; Rauville—very poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Lamoure—more than 60 inches; Rauville—more than 40 inches
High water table: Lamoure—at the surface to 1.5 feet below the surface; Rauville—at the surface to 0.5 foot below the surface
Flooding: Lamoure—frequent for brief periods; Rauville—frequent for long periods
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Very low
Other properties: Both soils have a high content of lime and typically are dissected by a meandering channel (fig. 10).

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Divide soils on high flood plains
• Ludden soils, which have more clay and less sand in the subsoil than the major soils; on low flood plains
• Marysland soils, which have gravelly material at a depth of 20 to 40 inches; on low flood plains

Similar inclusions:
• Soils that have a surface layer of silt loam

Figure 10.—An area of Lamoure-Rauville silty clay loams, channeled. Most areas are used for pasture and hay.

Use and Management

Rangeland

Suitability for crops: Unsuited
Management concerns: Flooding, high water table, meandering channels (which limit cultivation), and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Proper grazing management helps to maintain plant vigor, minimize soil compaction, and control streambank erosion.

Interpretive Groups

Land capability classification: Lamoure—6w; Rauville—5w
Range site: Lamoure—Subirrigated; Rauville—Wetland
Windbreak suitability group: Lamoure—2K; Rauville—10
Pasture suitability group: Lamoure—NS; Rauville—NS

LnB—Lanona-Swenoda sandy loams, 2 to 6 percent slopes

Composition

Lanona and similar soils: 60 to 65 percent
Swenoda and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Lanona—summits and backslopes; Swenoda—footslopes

Slope range: Lanona—2 to 6 percent; Swenoda—2 to 4 percent
Shape of areas: Irregular
Size of areas: 5 to 350 acres

Typical Profile

Lanona

Surface layer:
0 to 8 inches—dark gray sandy loam

Subsoil:
8 to 14 inches—grayish brown fine sandy loam
14 to 34 inches—yellowish brown fine sandy loam
34 to 50 inches—light yellowish brown, mottled, calcareous silt loam

Underlying layer:
50 to 80 inches—pale yellow, mottled, calcareous clay loam

Swenoda

Surface layer:
0 to 8 inches—dark gray sandy loam

Subsoil:
8 to 18 inches—brown fine sandy loam
18 to 29 inches—light olive brown fine sandy loam
29 to 34 inches—light olive brown loam
34 to 50 inches—light yellowish brown, calcareous clay loam

Underlying layer:
50 to 60 inches—light yellowish brown, calcareous clay loam with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Lanona—well drained; Swenoda—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches to glacial till or glaciolacustrine sediments
Depth to high water table: Lanona—more than 6 feet; Swenoda—2.5 to 4.0 feet
Flooding: None
Ponding: None
Permeability: Moderately rapid in the loamy sediments and moderately slow in the underlying material
Available water capacity: Moderate
Content of organic matter: High
Surface runoff: Medium
Other properties: Runoff water flows over the Swenoda soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- Doland soils, which have more silt and clay and less sand than the major soils; on backslopes
- Strayhoss soils, which have more silt and clay and less sand in the upper part than the major soils; on backslopes
- The somewhat excessively drained Maddock soils on summits

Similar inclusions:
- Soils that are deeper to glacial till
- Soils that have a surface layer of loam

Use and Management

Cropland

Main crops: Alfalfa, oats, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Wind erosion, water erosion, the moderate available water capacity, and agrochemical leaching
Management considerations:
- These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface help to control erosion and maintain the content of organic matter.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.
- Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: Lanona—3e; Swenoda—3e
Range site: Lanona—Sandy; Swenoda—Sandy
Windbreak suitability group: Lanona—5; Swenoda—5
Pasture suitability group: Lanona—H; Swenoda—H

Lo—Lowe loam, 0 to 1 percent slopes

Composition

Lowe and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Flood plains

Position on the landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Surface layer:
0 to 10 inches—very dark gray, calcareous loam

Subsoil:
10 to 24 inches—dark gray, calcareous clay loam
24 to 36 inches—gray, calcareous clay loam

Underlying layer:
36 to 70 inches—gray, calcareous, stratified loam and clay loam with redoximorphic concentrations
70 to 80 inches—light olive gray, calcareous, stratified sandy loam with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: At the surface to 1.5 feet below the surface
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Very low
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• Ludden soils, which have more clay and less sand in the subsoil than the Lowe soil; on low flood plains
• The somewhat poorly drained Moritz soils on low flood plains
• Marysland soils, which have gravelly material at a depth of 20 to 40 inches; on low flood plains
• The very poorly drained Rauville soils on low flood plains

Similar inclusions:
• Soils that have fewer carbonates in the subsoil than the Lowe soil
• Soils that have a surface layer of silt loam

Use and Management

Cropland and pasture

Main crops: Corn and soybeans
Suitability for crops: Poorly suited
Management concerns: Flooding, high water table, the high content of lime (which adversely affects the availability of plant nutrients), and wind erosion
Management considerations:
• In wet years this soil is better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth, prevent soil compaction, and control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Maintaining existing drainage systems helps to remove excess water.
• Permanent pasture or hayland species should be established.

Interpretive Groups

Land capability classification: 4w
Range site: Subirrigated
Windbreak suitability group: 10
Pasture suitability group: A

Lr—Lowe-Ludden complex, 0 to 1 percent slopes

Composition

Lowe and similar soils: 45 to 50 percent
Ludden and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Flood plains
Position on the landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 2,000 acres

Typical Profile

Lowe

Surface layer:
0 to 10 inches—very dark gray, calcareous loam

Subsoil:
10 to 24 inches—dark gray, calcareous clay loam
24 to 36 inches—gray, calcareous clay loam

Underlying layer:
36 to 70 inches—gray, calcareous, stratified loam and clay loam with redoximorphic concentrations
70 to 80 inches—light olive gray, calcareous, stratified sandy loam with redoximorphic concentrations

Ludden

Surface layer:
0 to 9 inches—very dark gray, calcareous silty clay

Subsoil:
9 to 22 inches—dark gray, calcareous silty clay
22 to 40 inches—dark gray, calcareous clay

Underlying layer:
40 to 60 inches—gray, calcareous clay with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: Lowe—at the surface to 1.5 feet below the surface; Ludden—0.5 foot above to 1.5 feet below the surface
Flooding: Lowe—occasional for brief periods; Ludden—frequent for long periods
Ponding: None
Permeability: Lowe—moderate; Ludden—slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Very low
Other properties: Both soils have a high content of lime.

Inclusions

Contrasting inclusions:
- Marysland soils, which have gravelly material at a depth of 20 to 40 inches; on low flood plains
- The somewhat poorly drained Divide soils, which have gravelly material at a depth of 20 to 40 inches; on high flood plains
- The somewhat poorly drained Moritz soils on high flood plains
- The very poorly drained Rauville soils on low flood plains

Similar inclusions:
- Soils that have a surface layer of silty clay loam

Use and Management

Cropland and pasture

Main crops: Corn and soybeans
Suitability for crops: Poorly suited
Management concerns: Flooding, high water table, wind erosion, the high content of lime (which adversely affects the availability of plant nutrients), and soil compaction (if the soils are tilled when wet)
Management considerations:
- In wet years these soils are better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage during wet periods help to maintain tilth, prevent soil compaction, and control erosion.
- Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
- Maintaining existing drainage systems helps to remove excess water.
- Permanent pasture or hayland species should be established.

Interpretive Groups

Land capability classification: Lowe—4w; Ludden—4w
Range site: Lowe—Subirrigated; Ludden—Wetland
Windbreak suitability group: Lowe—10; Ludden—10
Pasture suitability group: Lowe—A; Ludden—B1

Ls—Ludden silty clay, 0 to 1 percent slopes

Composition

Ludden and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Flood plains
Position on the landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 5 to 200 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark gray, calcareous silty clay

Subsoil:
9 to 22 inches—dark gray, calcareous silty clay
22 to 40 inches—dark gray, calcareous clay

Underlying layer:
40 to 60 inches—gray, calcareous clay with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: 0.5 foot above to 1.5 feet below the surface
Flooding: Frequent for long periods
Ponding: None
Permeability: Slow
Available water capacity: High

Content of organic matter: High
Surface runoff: Very low
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• Lamoure and Lowe soils, which that have less clay throughout than the Ludden soil; on low flood plains
• Marysland soils, which have gravelly material at a depth of 20 to 40 inches; on low flood plains
• The very poorly drained Rauville soils on low flood plains

Similar inclusions:
• Soils that have a surface layer of silty clay loam
• Soils that do not have free carbonates within a depth of 10 inches

Use and Management

Cropland and pasture

Main crops: Corn and soybeans
Suitability for crops: Poorly suited
Management concerns: Flooding, high water table, and soil compaction (if the soil is tilled when wet)
Management considerations:
• In wet years this soil is better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth and prevent soil compaction.
• Rotations that include grasses and legumes help to control erosion and maintain fertility, tilth, and the content of organic matter.
• Chiseling or subsoiling during dry periods increases the rate of water infiltration.
• Permanent pasture or hayland species should be established.

Interpretive Groups

Land capability classification: 4w
Range site: Wetland
Windbreak suitability group: 10
Pasture suitability group: B1

Lu—Ludden, saline-Ludden silty clays, 0 to 1 percent slopes

Composition

Ludden, saline, and similar soils: 45 to 50 percent
Ludden and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Flood plains
Position on the landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 1,000 acres

Typical Profile

Ludden, saline

Surface layer:
0 to 9 inches—very dark gray, calcareous silty clay with nests of salt

Subsoil:
9 to 22 inches—dark gray, calcareous silty clay with nests of salt
22 to 40 inches—dark gray, calcareous clay with nests of salt

Underlying layer:
40 to 60 inches—gray, calcareous clay with nests of gypsum and other salts and with redoximorphic concentrations

Ludden

Surface layer:
0 to 9 inches—very dark gray, calcareous silty clay

Subsoil:
9 to 22 inches—dark gray, calcareous silty clay
22 to 40 inches—dark gray, calcareous clay

Underlying layer:
40 to 60 inches—gray, calcareous clay with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: 0.5 foot above to 1.5 feet below the surface
Flooding: Frequent for long periods
Ponding: None
Permeability: Slow
Available water capacity: Ludden, saline—moderate; Ludden—high
Content of organic matter: High
Surface runoff: Very low
Other properties: Both soils have a high content of lime. The saline Ludden soil has a high content of salts.

Inclusions

Contrasting inclusions:
• Lamoure and Lowe soils, which have less clay in the subsoil than the major soils; on low flood plains

• Marysland soils, which have gravelly material at a depth of 20 to 40 inches; on low flood plains
• The very poorly drained Rauville soils on low flood plains

Similar inclusions:
• Soils that have a surface layer of silty clay loam
• Soils that do not have free carbonates within a depth of 10 inches

Use and Management

Cropland and pasture

Main crops: Corn
Suitability for crops: Poorly suited
Management concerns: Flooding, high water table, salinity, wind erosion, soil compaction (if the soils are tilled when wet), and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• In most years these soils are better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage during wet periods help to maintain tilth, prevent soil compaction, and control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Chiseling or subsoiling during dry periods increases the rate of water infiltration.
• Maintaining existing drainage systems helps to remove excess water.
• Salt-tolerant crops or grasses should be selected for planting.
• Permanent pasture or hayland species should be established.

Interpretive Groups

Land capability classification: Ludden, saline—4w; Ludden—4w
Range site: Ludden, saline—Saline Lowland; Ludden—Wetland
Windbreak suitability group: Ludden, saline—10; Ludden—10
Pasture suitability group: Ludden, saline—J; Ludden—B1

M-W—Miscellaneous water

• This map unit consists of small manmade areas that are used for industrial, sanitary, or mining applications and that contain water most of the year.

MaB—Maddock-Egeland sandy loams, 2 to 6 percent slopes

Composition

Maddock and similar soils: 50 to 60 percent
Egeland and similar soils: 30 to 35 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Outwash plains
Position on the landform: Maddock—summits; Egeland—backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Typical Profile

Maddock

Surface layer:
0 to 7 inches—very dark gray sandy loam

Subsoil:
7 to 20 inches—brown loamy sand

Underlying layer:
20 to 40 inches—brown sand
40 to 80 inches—yellowish brown, calcareous sand and loamy sand

Egeland

Surface layer:
0 to 8 inches—dark gray sandy loam

Subsoil:
8 to 14 inches—brown sandy loam
14 to 30 inches—light yellowish brown, calcareous sandy loam

Underlying layer:
30 to 80 inches—light yellowish brown, calcareous loamy sand

Soil Properties and Qualities

Drainage class: Maddock—somewhat excessively drained; Egeland—well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Maddock—rapid; Egeland—moderately rapid

Available water capacity: Maddock—low; Egeland—moderate
Content of organic matter: Moderately low
Surface runoff: Maddock—very low; Egeland—medium

Inclusions

Contrasting inclusions:
• The moderately well drained Embden soils on footslopes

Similar inclusions:
• Soils that have a surface layer of loam
• Soils that have glacial till below a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, oats, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Maddock—wind erosion, water erosion, the low available water capacity, and agrochemical leaching; Egeland—wind erosion, water erosion, the moderate available water capacity, and agrochemical leaching
Management considerations:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface help to control erosion and maintain the content of organic matter.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: Maddock—3e; Egeland—3e
Range site: Maddock—Sandy; Egeland—Sandy
Windbreak suitability group: Maddock—5; Egeland—5
Pasture suitability group: Maddock—H; Egeland—H

MaC—Maddock-Egeland sandy loams, 6 to 9 percent slopes

Composition

Maddock and similar soils: 60 to 65 percent
Egeland and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Outwash plains
Position on the landform: Maddock—summits and shoulders; Egeland—backslopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Maddock

Surface layer:
0 to 7 inches—very dark gray sandy loam

Subsoil:
7 to 20 inches—brown loamy sand

Underlying layer:
20 to 40 inches—brown sand
40 to 80 inches—yellowish brown, calcareous sand and loamy sand

Egeland

Surface layer:
0 to 8 inches—dark gray sandy loam

Subsoil:
8 to 14 inches—brown sandy loam
14 to 30 inches—light yellowish brown, calcareous sandy loam

Underlying layer:
30 to 80 inches—light yellowish brown, calcareous loamy sand

Soil Properties and Qualities

Drainage class: Maddock—somewhat excessively drained; Egeland—well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Maddock—rapid; Egeland—moderately rapid
Available water capacity: Maddock—low; Egeland—moderate
Content of organic matter: Moderately low
Surface runoff: Maddock—low; Egeland—medium

Inclusions

Contrasting inclusions:
• Doland soils, which have glacial till at a depth of 15 to 30 inches; on summits and backslopes

• The moderately well drained Embden soils on footslopes
• Strayhoss soils, which have more silt and less sand in the upper part than the major soils; on backslopes

Similar inclusions:
• Soils that have glacial till below a depth of 40 inches

Use and Management

Cropland and pasture

Main crops: Alfalfa, oats, and spring wheat
Suitability for crops: Poorly suited
Management concerns: Maddock—wind erosion, water erosion, the low available water capacity, and agrochemical leaching; Egeland—wind erosion, water erosion, the moderate available water capacity, and agrochemical leaching
Management considerations:
• Seeding cultivated areas to adapted grasses helps to control erosion.
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: Maddock—4e; Egeland—4e
Range site: Maddock—Sandy; Egeland—Sandy
Windbreak suitability group: Maddock—5; Egeland—5
Pasture suitability group: Maddock—H; Egeland—H

MeA—Maddock-Embden complex, 0 to 2 percent slopes

Composition

Maddock and similar soils: 45 to 55 percent
Embden and similar soils: 35 to 40 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Outwash plains
Position on the landform: Maddock—summits and backslopes; Embden—footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 250 acres

Typical Profile

Maddock

Surface layer:
0 to 7 inches—very dark gray sandy loam

Subsoil:
7 to 20 inches—brown loamy sand

Underlying layer:
20 to 40 inches—brown sand
40 to 80 inches—yellowish brown, calcareous sand and loamy sand

Embden

Surface soil:
0 to 16 inches—very dark grayish brown fine sandy loam

Subsoil:
16 to 29 inches—brown fine sandy loam
29 to 34 inches—pale brown, calcareous loamy fine sand

Underlying layer:
34 to 38 inches—pale brown, calcareous fine sandy loam with redoximorphic concentrations
38 to 80 inches—pale brown, calcareous loamy sand with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Maddock—somewhat excessively drained; Embden—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: Maddock—more than 6 feet; Embden—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Maddock—rapid; Embden—moderately rapid
Available water capacity: Maddock—low; Embden—moderate
Content of organic matter: Maddock—moderately low; Embden—high
Surface runoff: Maddock—very low; Embden—low
Other properties: Runoff water flows over the Embden soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• Allivar soils, which have gravelly material at a depth of 14 to 25 inches; on nearby high flood plains

• The somewhat poorly drained Divide soils on nearby high flood plains
• The well drained Egeland soils, which have less sand in the upper part than the Maddock soil; on summits

Similar inclusions:
• Soils that have a surface layer of loam
• Soils that have glacial till below a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, oats, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Maddock—wind erosion, water erosion, the low available water capacity, and agrochemical leaching; Embden—wind erosion, the moderate available water capacity, and agrochemical leaching
Management considerations:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface help to control erosion and maintain the content of organic matter.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: Maddock—2s; Embden—2s
Range site: Maddock—Sandy; Embden—Sandy
Windbreak suitability group: Maddock—5; Embden—1
Pasture suitability group: Maddock—H; Embden—H

Mr—Marysland loam, 0 to 1 percent slopes

Composition

Marysland and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Flood plains
Position on the landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 500 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark gray, calcareous loam

Subsurface layer:
9 to 14 inches—dark gray, calcareous clay loam

Subsoil:
14 to 23 inches—gray, calcareous clay loam with redoximorphic depletions
23 to 33 inches—gray, calcareous clay loam with redoximorphic concentrations
33 to 38 inches—light brownish gray, calcareous loam with redoximorphic concentrations

Underlying layer:
38 to 80 inches—light brownish gray, calcareous very gravelly sand, fine sand, and gravelly sand with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches to gravelly material
Depth to high water table: 0.5 foot to 1.5 feet
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Content of organic matter: Moderate
Surface runoff: Very low
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Divide soils on high flood plains
• Lamoure soils, which are not underlain by gravelly material; on low flood plains
• The very poorly drained Rauville soils on low flood plains

Similar inclusions:
• Soils that are not subject to flooding

Use and Management

Cropland and pasture

Main crops: Corn and soybeans
Suitability for crops: Poorly suited
Management concerns: Flooding, high water table, wind erosion, the high content of lime (which adversely affects the availability of plant nutrients),

agrochemical leaching, and soil compaction (if the soil is tilled when wet)

Management considerations:

• In wet years this soil is better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth and control erosion.

• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

• Maintaining existing drainage systems helps to remove excess water.

• Permanent pasture or hayland species should be established.

Interpretive Groups

Land capability classification: 4w
Range site: Subirrigated
Windbreak suitability group: 10
Pasture suitability group: B1

Mt—McIntosh-Badger silty clay loams, 0 to 2 percent slopes

Composition

McIntosh and similar soils: 55 to 65 percent
Badger and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: McIntosh—footslopes; Badger—toeslopes
Slope range: McIntosh—0 to 2 percent; Badger—0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 1,300 acres

Typical Profile

McIntosh

Surface soil:
0 to 15 inches—very dark gray, calcareous silty clay loam

Subsoil:
15 to 19 inches—grayish brown, calcareous silty clay loam
19 to 31 inches—light yellowish brown, calcareous silty clay loam

Underlying layer:
31 to 41 inches—light yellowish brown, calcareous loam with redoximorphic depletions
41 to 80 inches—light yellowish brown, calcareous clay loam with redoximorphic concentrations and depletions

Badger

Surface soil:
0 to 17 inches—very dark gray silty clay loam

Subsoil:
17 to 34 inches—dark gray silty clay
34 to 42 inches—dark grayish brown silty clay
42 to 58 inches—light brownish gray, calcareous silt loam with redoximorphic concentrations and depletions

Underlying layer:
58 to 60 inches—light brownish gray, calcareous silt loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: McIntosh—24 to 40 inches to loamy glacial till; Badger—more than 40 inches to glacial till
High water table: McIntosh—at a depth of 1.5 to 2.5 feet; Badger—at the surface to 3 feet below the surface
Flooding: McIntosh—none; Badger—frequent for brief periods
Ponding: None
Permeability: McIntosh—moderately slow; Badger—slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Low
Other properties: The McIntosh soil has a high content of lime.

Inclusions

Contrasting inclusions:

• The moderately well drained Brookings soils on footslopes

• The poorly drained Lamoure soils on low flood plains

• The very poorly drained Parnell and poorly drained Tonka soils in basins

Similar inclusions:

• Soils that are deeper to glacial till than the McIntosh soil

• Soils that are similar to the McIntosh soil but have less silt and more sand

• Soils that are similar to the Badger soil but have less clay in the upper part

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: McIntosh—high water table, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Badger—flooding, high water table, and soil compaction (if the soil is tilled when wet)
Management considerations:
• In wet years these soils are better suited to late-planted crops than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Deferring tillage when the Badger soil is wet helps to prevent soil compaction.

Interpretive Groups

Land capability classification: McIntosh—2s; Badger—2w
Range site: McIntosh—Limy Subirrigated; Badger—Loamy Overflow
Windbreak suitability group: McIntosh—1K; Badger—2
Pasture suitability group: McIntosh—F; Badger—A

Mu—McIntosh-Lamoure silty clay loams, 0 to 2 percent slopes

Composition

McIntosh and similar soils: 55 to 65 percent
Lamoure and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains and flood plains
Position on the landform: McIntosh—footslopes; Lamoure—low flood plains
Slope range: McIntosh—0 to 2 percent; Lamoure—0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 5 to 120 acres

Typical Profile

McIntosh

Surface soil:
0 to 15 inches—very dark gray, calcareous silty clay loam

Subsoil:
15 to 19 inches—grayish brown, calcareous silty clay loam
19 to 31 inches—light yellowish brown, calcareous silty clay loam

Underlying layer:
31 to 41 inches—light yellowish brown, calcareous loam with redoximorphic depletions
41 to 80 inches—light yellowish brown, calcareous clay loam with redoximorphic concentrations and depletions

Lamoure

Surface soil:
0 to 28 inches—dark gray, calcareous silty clay loam (redoximorphic concentrations in the lower part)

Underlying layer:
28 to 57 inches—gray and very dark gray, calcareous silty clay loam
57 to 60 inches—grayish brown, calcareous gravelly loam

Soil Properties and Qualities

Drainage class: McIntosh—somewhat poorly drained; Lamoure—poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: McIntosh—24 to 40 inches to loamy glacial till; Lamoure—more than 60 inches
High water table: McIntosh—at a depth of 1.5 to 2.5 feet; Lamoure—at the surface to 1.5 feet below the surface
Flooding: McIntosh—none; Lamoure—frequent for brief periods
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: McIntosh—low; Lamoure—very low
Other properties: Both soils have a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• The moderately well drained Brookings soils on footslopes

Similar inclusions:
• Soils that are deeper to glacial till than the McIntosh soil

• Soils that are similar to the McIntosh soil but have less silt and more sand
• Soils that have a surface layer of silt loam

Use and Management

Cropland

Main crops: Corn and soybeans
Suitability for crops: Fairly well suited
Management concerns: McIntosh—high water table, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Lamoure—flooding, high water table, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• In wet years these soils are better suited to late-planted crops than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: McIntosh—2s; Lamoure—4w
Range site: McIntosh—Limy Subirrigated; Lamoure—Subirrigated
Windbreak suitability group: McIntosh—1K; Lamoure—2K
Pasture suitability group: McIntosh—F; Lamoure—B1

Mw—Minnewaukan loamy sand, 0 to 3 percent slopes

Composition

Minnewaukan and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Lake plains
Position on the landform: Toeslopes
Slope range: 0 to 3 percent
Shape of areas: Long and narrow
Size of areas: 5 to 30 acres

Typical Profile

Surface layer:
0 to 5 inches—dark gray loamy sand

Transitional layer:
5 to 9 inches—dark gray, calcareous loamy sand

Underlying layer:
9 to 12 inches—grayish brown and light brownish gray, calcareous medium sand and coarse sand
12 to 60 inches—light brownish gray and gray coarse sand to fine sand

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: 0.5 foot above to 1.5 feet below the surface
Flooding: Occasional for long periods
Ponding: None
Permeability: Rapid
Available water capacity: Low
Content of organic matter: Moderately low
Surface runoff: Very low

Inclusions

Contrasting inclusions:
• The very poorly drained Oldham and Southam soils in basins

Similar inclusions:
• Soils that are somewhat poorly drained

Use and Management

Rangeland and pasture

Suitability for crops: Generally unsuited
Management concerns: Flooding, high water table, and wind erosion
Management considerations:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: 4w
Range site: Subirrigated
Windbreak suitability group: 2
Pasture suitability group: A

Mz—Moritz-Lamoure complex, 0 to 2 percent slopes

Composition

Moritz and similar soils: 50 to 55 percent

Lamoure and similar soils: 35 to 40 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains
Position on the landform: Moritz—high flood plains; Lamoure—low flood plains
Slope range: Moritz—0 to 2 percent; Lamoure—0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 2,500 acres

Typical Profile

Moritz

Surface layer:
0 to 10 inches—very dark gray, calcareous loam

Subsurface layer:
10 to 15 inches—dark gray, calcareous loam

Subsoil:
15 to 24 inches—gray, calcareous loam
24 to 42 inches—light yellowish brown, calcareous loam

Underlying layer:
42 to 61 inches—light gray, calcareous clay loam with redoximorphic concentrations
61 to 80 inches—olive gray, calcareous loam with redoximorphic concentrations

Lamoure

Surface soil:
0 to 28 inches—dark gray, calcareous silty clay loam (redoximorphic concentrations in the lower part)

Underlying layer:
28 to 57 inches—gray and very dark gray, calcareous silty clay loam
57 to 60 inches—grayish brown, calcareous gravelly loam

Soil Properties and Qualities

Drainage class: Moritz—somewhat poorly drained; Lamoure—poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: Moritz—at a depth of 1.5 to 3.0 feet; Lamoure—at the surface to 1.5 feet below the surface
Flooding: Moritz—occasional for brief periods; Lamoure—frequent for brief periods
Ponding: None
Permeability: Moritz—moderate; Lamoure—moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Moritz—low; Lamoure—very low
Other properties: Both soils have a high content of lime.

Inclusions

Contrasting inclusions:
• Divide soils, which have gravelly material at a depth of 20 to 40 inches; on high flood plains
• The moderately well drained La Prairie soils on high flood plains
• The very poorly drained Rauville soils on low flood plains
• The poorly drained Lowe soils, which have more carbonates within a depth of 16 inches than the Lamoure soil; on low flood plains
• Ludden soils, which have more clay and less sand in the subsoil than the major soils; on low flood plains

Similar inclusions:
• Soils that are not calcareous at the surface

Use and Management

Cropland

Main crops: Corn and soybeans
Suitability for crops: Fairly well suited
Management concerns: Flooding, high water table, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• In wet years these soils are better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage during wet periods help to maintain tilth, prevent soil compaction, and control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Moritz—2s; Lamoure—4w
Range site: Moritz—Limy Subirrigated; Lamoure—Subirrigated
Windbreak suitability group: Moritz—1K; Lamoure—2K
Pasture suitability group: Moritz—K; Lamoure—B1

Od—Oldham silty clay loam, 0 to 1 percent slopes

Composition

Oldham and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 5 to 200 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark gray, calcareous silty clay loam

Subsoil:
9 to 19 inches—gray, calcareous silty clay
19 to 40 inches—gray, calcareous silty clay with redoximorphic concentrations

Underlying layer:
40 to 72 inches—light gray and light olive gray, calcareous silt loam with redoximorphic concentrations and depletions
72 to 80 inches—light olive gray, calcareous silty clay loam with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: 1 foot above to 1 foot below the surface
Flooding: None
Ponding: Occasional for long periods
Permeability: Slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Negligible
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The calcareous Cubden, Hamerly, and McIntosh soils on footslopes
• The poorly drained Minnewaukan soils on beaches

Similar inclusions:
• Soils that do not have dark colors more than 24 inches thick
• Soils that have less clay throughout than the Oldham soil
• Soils that are deeper to carbonates than the Oldham soil

Use and Management

Pasture and cropland

Main crops: Corn and soybeans
Suitability for crops: Undrained areas—generally unsuited; drained areas—fairly well suited
Management concerns: Ponding, high water table, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• In undrained areas, proper grazing management helps to maintain plant vigor. In drained areas, leaving crop residue on the surface, including grasses and legumes in the cropping system, and deferring tillage when the soil is wet help to maintain tilth, prevent soil compaction, and control erosion.
• Maintaining existing drainage systems helps to remove excess water.
• Restricting grazing during wet periods helps to minimize soil compaction.
• Permanent pasture or hayland species should be established.

Interpretive Groups

Land capability classification: 5w
Range site: Wetland
Windbreak suitability group: 10
Pasture suitability group: B2

Og—Orthents, gravelly

Composition

Orthents and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Outwash plains and moraines
Position on the landform: Excavations and spoil areas
Slope range: 0 to 60 percent
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Surface layer:
0 to 3 inches—grayish brown, calcareous very gravelly loamy sand

Underlying layer:
3 to 24 inches—light yellowish brown, calcareous

very gravelly loamy coarse sand and loamy very fine sand
24 to 80 inches—very pale brown, calcareous very gravelly loamy coarse sand

Soil Properties and Qualities

Drainage class: Excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Very rapid
Available water capacity: Very low
Content of organic matter: Low
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• Brandt, Estelline, Fordville, Renshaw, and Sioux soils along the edges of some mapped areas

Use and Management

Wildlife habitat and rangeland

Suitability for crops: Not suited
Management concerns: The very low available water capacity, agrochemical leaching, and a high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Most areas of this map unit are gravel pits used mainly as a source of sand and gravel for construction purposes. Some areas provide limited wildlife habitat. Abandoned gravel pits can be restored to range, tame pasture, or cropland if reclamation measures are applied.
• Shaping the area can reduce the slope. Mounds of overburden can be used as topsoil dressing.
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.
• Applying fertilizer as needed helps to establish the range or pasture plantings.

Interpretive Groups

Land capability classification: 8s
Range site: Very Shallow
Windbreak suitability group: 10
Pasture suitability group: NS

Or—Orthents, loamy

Composition

Orthents and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains and moraines
Position on the landform: Excavations and spoil areas
Slope range: 0 to 9 percent
Shape of areas: Irregular
Size of areas: 5 to 250 acres

Typical Profile

Surface layer:
0 to 9 inches—dark gray, calcareous clay loam

Underlying layer:
9 to 80 inches—light yellowish brown, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Moderately low
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• Barnes, Brookings, Buse, McIntosh, and Vienna soils along the edges of some mapped areas

Use and Management

Cropland and pasture

Main crops: Alfalfa
Suitability for crops: Poorly suited
Management concerns: Infiltration rate, water erosion, and a high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Leaving crop residue on the surface, minimizing tillage, and including grasses and legumes in the cropping system help to control erosion, conserve

moisture, maintain the content of organic matter, and improve fertility.

- Chiseling or subsoiling when the soil is dry increases the rate of water infiltration and improves tilth.
- Cultivated areas can be seeded to permanent pasture or hayland species.

Interpretive Groups

Land capability classification: 4e
Range site: Thin Upland
Windbreak suitability group: 8
Pasture suitability group: G

Pa—Parnell silty clay loam, 0 to 1 percent slopes

Composition

Parnell and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Position on the landform: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 10 inches—very dark gray silty clay loam

Subsurface layer:
10 to 17 inches—dark gray silty clay loam with redoximorphic concentrations

Subsoil:
17 to 27 inches—dark gray silty clay with redoximorphic concentrations
27 to 45 inches—olive gray silty clay with redoximorphic concentrations

Underlying layer:
45 to 54 inches—light olive gray silty clay with redoximorphic concentrations
54 to 60 inches—light gray silty clay loam with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: 2.0 feet above to 0.5 foot below the surface
Flooding: None
Ponding: Occasional for brief periods
Permeability: Slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Negligible

Inclusions

Contrasting inclusions:
- The calcareous Cubden, Hamerly, and McIntosh soils on footslopes
- The poorly drained Tonka soils around the edges of basins

Similar inclusions:
- Soils that are calcareous to the surface

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Ponding, high water table, and soil compaction
Management considerations:
- Proper grazing management helps to maintain plant vigor.
- Restricting grazing during wet periods helps to minimize soil compaction.
- Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: 5w
Range site: Shallow Marsh
Windbreak suitability group: 10
Pasture suitability group: B2

PbB—Poinsett-Buse-Waubay complex, 1 to 6 percent slopes

Composition

Poinsett and similar soils: 30 to 40 percent
Buse and similar soils: 25 to 30 percent
Waubay and similar soils: 20 to 25 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Poinsett—summits and backslopes; Buse—shoulders; Waubay—footslopes

Slope range: Poinsett—2 to 6 percent; Buse—3 to 6 percent; Waubay—1 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 3,500 acres

Typical Profile

Poinsett

Surface layer:
0 to 8 inches—dark gray silty clay loam

Subsoil:
8 to 13 inches—dark grayish brown silty clay loam
13 to 23 inches—brown silty clay loam
23 to 46 inches—light brownish gray, mottled, calcareous silty clay loam
46 to 62 inches—light gray, mottled, calcareous silty clay loam

Underlying layer:
62 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Buse

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 32 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
32 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Waubay

Surface soil:
0 to 12 inches—dark gray silty clay loam

Subsoil:
12 to 25 inches—dark gray silty clay loam
25 to 32 inches—grayish brown, calcareous silty clay loam
32 to 41 inches—light brownish gray, calcareous silty clay loam

Underlying layer:
41 to 60 inches—light brownish gray, calcareous silty clay loam with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Buse—well drained; Waubay—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Poinsett—more than 40 inches to loamy glacial till; Buse—more than 60 inches; Waubay—more than 40 inches to loamy glacial till
Depth to high water table: Poinsett—more than 6 feet; Buse—more than 6 feet; Waubay—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Poinsett—moderate; Buse—moderately slow; Waubay—moderate
Available water capacity: High
Content of organic matter: Poinsett—high; Buse—moderately low; Waubay—high
Surface runoff: Poinsett—medium; Buse—medium; Waubay—low
Other properties: The Buse soil has a high content of lime. Runoff water flows over the Waubay soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Badger soils on toeslopes
- The somewhat poorly drained, calcareous Cubden soils on footslopes
- The very poorly drained Parnell and poorly drained Tonka soils in basins

Similar inclusions:
- Soils that have more clay in the subsoil than the Poinsett soil
- Soils that are similar to the Poinsett and Waubay soils but have glacial till above a depth of 40 inches
- Soils that contain less sand and more silt throughout than the Buse soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Poinsett—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Waubay—few limitations
Management considerations:
- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming and grassed waterways help to control water erosion, but the slopes in most areas are too short or too irregular for contour farming.
- Wind stripcropping and field windbreaks help to control wind erosion.
- Rotations that include grasses and legumes help to

control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Poinsett—2e; Buse—3e; Waubay—1
Range site: Poinsett—Silty; Buse—Thin Upland; Waubay—Loamy Overflow
Windbreak suitability group: Poinsett—3; Buse—8; Waubay—1
Pasture suitability group: Poinsett—F; Buse—G; Waubay—K

PbC—Poinsett-Buse-Waubay complex, 2 to 9 percent slopes

Composition

Poinsett and similar soils: 35 to 40 percent
Buse and similar soils: 25 to 30 percent
Waubay and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Moraines and till plains
Position on the landform: Poinsett—summits and backslopes; Buse—shoulders; Waubay—footslopes
Slope range: Poinsett—6 to 9 percent; Buse—6 to 9 percent; Waubay—2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 1,300 acres

Typical Profile

Poinsett

Surface layer:
0 to 8 inches—dark gray silty clay loam

Subsoil:
8 to 13 inches—dark grayish brown silty clay loam
13 to 23 inches—brown silty clay loam
23 to 46 inches—light brownish gray, mottled, calcareous silty clay loam
46 to 62 inches—light gray, mottled, calcareous silty clay loam

Underlying layer:
62 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Buse

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 32 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
32 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Waubay

Surface soil:
0 to 12 inches—dark gray silty clay loam

Subsoil:
12 to 25 inches—dark gray silty clay loam
25 to 32 inches—grayish brown, calcareous silty clay loam
32 to 41 inches—light brownish gray, calcareous silty clay loam

Underlying layer:
41 to 60 inches—light brownish gray, calcareous silty clay loam with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Buse—well drained; Waubay—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Poinsett—more than 40 inches to loamy glacial till; Buse—more than 60 inches; Waubay—more than 40 inches to loamy glacial till
Depth to high water table: Poinsett—more than 6 feet; Buse—more than 6 feet; Waubay—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Poinsett—moderate; Buse—moderately slow; Waubay—moderate
Available water capacity: High
Content of organic matter: Poinsett—high; Buse—moderately low; Waubay—high
Surface runoff: Medium
Other properties: The Buse soil has a high content of lime. Runoff water flows over the Waubay soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• The somewhat poorly drained, calcareous Cubden soils on footslopes
• The very poorly drained Parnell and poorly drained Tonka soils in basins

Similar inclusions:
• Soils that are similar to the Poinsett and Waubay soils but have glacial till above a depth of 40 inches
• Soils that have more clay in the subsoil than the Poinsett soil
• Soils that contain less sand and more silt throughout than the Buse soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Poinsett—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Waubay—water erosion
Management considerations:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming, terraces, and grassed waterways help to control water erosion, but the slopes in most areas are too short and too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Poinsett—3e; Buse—4e; Waubay—2e
Range site: Poinsett—Silty; Buse—Thin Upland; Waubay—Silty
Windbreak suitability group: Poinsett—3; Buse—8; Waubay—1
Pasture suitability group: Poinsett—F; Buse—G; Waubay—K

PwA—Poinsett-Waubay silty clay loams, 0 to 2 percent slopes

Composition

Poinsett and similar soils: 55 to 60 percent
Waubay and similar soils: 25 to 35 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Poinsett—summits and backslopes; Waubay—footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Poinsett

Surface layer:
0 to 8 inches—dark gray silty clay loam

Subsoil:
8 to 13 inches—dark grayish brown silty clay loam
13 to 23 inches—brown silty clay loam
23 to 46 inches—light brownish gray, mottled, calcareous silty clay loam
46 to 62 inches—light gray, mottled, calcareous silty clay loam

Underlying layer:
62 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Waubay

Surface soil:
0 to 12 inches—dark gray silty clay loam

Subsoil:
12 to 25 inches—dark gray silty clay loam
25 to 32 inches—grayish brown, calcareous silty clay loam
32 to 41 inches—light brownish gray, calcareous silty clay loam

Underlying layer:
41 to 60 inches—light brownish gray, calcareous silty clay loam with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Waubay—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches to loamy glacial till
Depth to high water table: Poinsett—more than 6 feet; Waubay—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Low
Other properties: Runoff water flows over the Waubay soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• The somewhat poorly drained, calcareous Cubden soils on footslopes
• The very poorly drained Parnell and poorly drained Tonka soils in basins

Similar inclusions:
• Soils that have glacial till above a depth of 40 inches
• Soils that have more clay in the subsoil than the Poinsett soil
• Soils that have a surface layer of silt loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Poinsett—1; Waubay—1
Range site: Poinsett—Silty; Waubay—Loamy Overflow
Windbreak suitability group: Poinsett—3; Waubay—1
Pasture suitability group: Poinsett—F; Waubay—K

PwB—Poinsett-Waubay silty clay loams, 1 to 6 percent slopes

Composition

Poinsett and similar soils: 60 to 65 percent
Waubay and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Poinsett—summits and backslopes; Waubay—footslopes
Slope range: Poinsett—2 to 6 percent; Waubay—1 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 750 acres

Typical Profile

Poinsett

Surface layer:
0 to 8 inches—dark gray silty clay loam

Subsoil:
8 to 13 inches—dark grayish brown silty clay loam
13 to 23 inches—brown silty clay loam
23 to 46 inches—light brownish gray, mottled, calcareous silty clay loam
46 to 62 inches—light gray, mottled, calcareous silty clay loam

Underlying layer:
62 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Waubay

Surface soil:
0 to 12 inches—dark gray silty clay loam

Subsoil:
12 to 25 inches—dark gray silty clay loam
25 to 32 inches—grayish brown, calcareous silty clay loam
32 to 41 inches—light brownish gray, calcareous silty clay loam

Underlying layer:
41 to 60 inches—light brownish gray, calcareous silty clay loam with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Waubay—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches to loamy glacial till
Depth to high water table: Poinsett—more than 6 feet; Waubay—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Poinsett—medium; Waubay—low
Other properties: Runoff water flows over the Waubay soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• The calcareous Buse soils on shoulders
• The somewhat poorly drained, calcareous Cubden soils on footslopes
• The very poorly drained Parnell and poorly drained Tonka soils in basins

Similar inclusions:
• Soils that have glacial till above a depth of 40 inches
• Soils that have more clay in the subsoil than the Poinsett soil
• Soils that have a surface layer of silt loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Poinsett—water erosion; Waubay—few limitations
Management considerations:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming and grassed waterways help to control water erosion, but the slopes in some areas are too short or too irregular for contour farming.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Poinsett—2e; Waubay—1
Range site: Poinsett—Silty; Waubay—Loamy Overflow
Windbreak suitability group: Poinsett—3; Waubay—1
Pasture suitability group: Poinsett—F; Waubay—K

Ra—Rauville silty clay loam, 0 to 1 percent slopes

Composition

Rauville and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Flood plains
Position on the landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 5 to 200 acres

Typical Profile

Surface layer:
0 to 10 inches—very dark gray, calcareous silty clay loam

Subsurface layer:
10 to 24 inches—very dark gray, calcareous silty clay loam with redoximorphic concentrations

Underlying layer:
24 to 48 inches—olive gray and light olive gray silty clay loam with redoximorphic concentrations
48 to 60 inches—grayish brown coarse sand

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches
High water table: At the surface to 0.5 foot below the surface
Flooding: Frequent for long periods
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Very low
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Divide soils on high flood plains
• The well drained Fordtown soils on high flood plains
• The somewhat poorly drained and poorly drained Lamoure soils on low flood plains
• The poorly drained Lowe and Marysland soils on low flood plains

Similar inclusions:
• Soils that have more clay and less silt throughout than the Rauville soil
• Soils that have a surface layer of silt loam

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Flooding, high water table, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Proper grazing management helps to maintain plant vigor.
• Restricting grazing during wet periods helps to minimize soil compaction.

Interpretive Groups

Land capability classification: 5w
Range site: Wetland
Windbreak suitability group: 10
Pasture suitability group: B1

Rp—Rauville silty clay loam, ponded

Composition

Rauville and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Flood plains
Position on the landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 450 acres

Typical Profile

Surface layer:
0 to 10 inches—very dark gray, calcareous silty clay loam

Subsurface layer:
10 to 24 inches—very dark gray, calcareous silty clay loam with redoximorphic concentrations

Underlying layer:
24 to 48 inches—olive gray and light olive gray, calcareous silty clay loam with redoximorphic concentrations
48 to 60 inches—grayish brown coarse sand

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches
High water table: 2.0 feet above to 0.5 foot below the surface
Flooding: None
Ponding: Frequent for long periods
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Very low
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained and poorly drained Lamoure soils on low flood plains
• The poorly drained Ludden soils on low flood plains
• The poorly drained Marysland soils, which have gravelly material at a depth of 20 to 40 inches; on low flood plains

Use and Management

Wildlife habitat

Suitability for crops: Unsuited
Management concerns: Flooding, ponding, high water table, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Areas of this map unit should be maintained as wildlife habitat (fig. 11).

Interpretive Groups

Land capability classification: 8w
Range site: Not assigned
Windbreak suitability group: 10
Pasture suitability group: NS

RsB—Renshaw-Sioux complex, 2 to 6 percent slopes

Composition

Renshaw and similar soils: 60 to 65 percent
Sioux and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Outwash plains
Position on the landform: Renshaw—backslopes; Sioux—summits and shoulders
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Renshaw

Surface layer:
0 to 7 inches—very dark gray loam

Subsoil:
7 to 12 inches—dark grayish brown loam
12 to 18 inches—brown loam

Underlying layer:
18 to 24 inches—brown, calcareous gravelly loamy sand
24 to 60 inches—brown, calcareous very gravelly loamy sand

Sioux

Surface layer:
0 to 7 inches—dark gray, calcareous gravelly loam

Figure 11.—Canada geese in an area of Rauville silty clay loam, ponded.

Transitional layer:
7 to 10 inches—grayish brown, calcareous gravelly loam

Underlying layer:
10 to 60 inches—pale brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Renshaw—somewhat excessively drained; Sioux—excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Renshaw—14 to 20 inches to gravelly material; Sioux—6 to 14 inches to gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Renshaw—moderate in the loamy sediments and very rapid in the underlying gravelly material; Sioux—very rapid
Available water capacity: Renshaw—low; Sioux—very low
Content of organic matter: Renshaw—moderate; Sioux—moderately low
Surface runoff: Renshaw—medium; Sioux—very low

Inclusions

Contrasting inclusions:
- The well drained Fordville soils on backslopes

Similar inclusions:
- Renshaw soils that have a surface layer of gravelly loam
- Soils that are similar to the major Renshaw soil but have less gravel throughout

Use and Management

Cropland and pasture

Main crops: Alfalfa, oats, and spring wheat
Suitability for crops: Poorly suited
Management concerns: Renshaw—the low available water capacity, water erosion, and agrochemical leaching; Sioux—the very low available water capacity, water erosion, agrochemical leaching, and a high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.
• Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Renshaw—4e; Sioux—6s
Range site: Renshaw—Shallow to Gravel; Sioux—Very Shallow
Windbreak suitability group: Renshaw—6G; Sioux—10
Pasture suitability group: Renshaw—D2; Sioux—NS

RsC—Renshaw-Sioux complex, 6 to 9 percent slopes

Composition

Renshaw and similar soils: 50 to 55 percent
Sioux and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Outwash plains
Position on the landform: Renshaw—backslopes; Sioux—summits and shoulders
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 5 to 120 acres

Typical Profile

Renshaw

Surface layer:
0 to 7 inches—very dark gray loam

Subsoil:
7 to 12 inches—dark grayish brown loam
12 to 18 inches—brown loam

Underlying layer:
18 to 24 inches—brown, calcareous gravelly loamy sand
24 to 60 inches—brown, calcareous very gravelly loamy sand

Sioux

Surface layer:
0 to 7 inches—dark gray, calcareous gravelly loam

Transitional layer:
7 to 10 inches—grayish brown, calcareous gravelly loam

Underlying layer:
10 to 60 inches—pale brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Renshaw—somewhat excessively drained; Sioux—excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Renshaw—14 to 20 inches to gravelly material; Sioux—6 to 14 inches to gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Renshaw—moderate in the loamy sediments and very rapid in the underlying gravelly material; Sioux—very rapid
Available water capacity: Renshaw—low; Sioux—very low
Content of organic matter: Renshaw—moderate; Sioux—moderately low
Surface runoff: Renshaw—medium; Sioux—low

Inclusions

Contrasting inclusions:
• The well drained Estelline soils, which have a silty surface layer and subsoil over gravelly material at a depth of 22 to 40 inches; on backslopes
• The well drained Fordville soils, which have a loamy surface layer and subsoil over gravelly material at a depth of 20 to 40 inches; on backslopes

Similar inclusions:
• Renshaw soils that have a surface layer of gravelly loam
• Soils that are similar to the major Renshaw soil but have less gravel throughout

Use and Management

Cropland and pasture

Main crops: Alfalfa, oats, and spring wheat
Suitability for crops: Poorly suited
Management concerns: Renshaw—the low available water capacity, water erosion, and agrochemical leaching; Sioux—the very low available water capacity, water erosion, agrochemical leaching, and a high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.
• Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Renshaw—4e; Sioux—6s
Range site: Renshaw—Shallow to Gravel; Sioux—Very Shallow
Windbreak suitability group: Renshaw—6G; Sioux—10
Pasture suitability group: Renshaw—D2; Sioux—NS

Rw—Renwash loam, 0 to 2 percent slopes

Composition

Renwash and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Flood plains
Position on the landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 450 acres

Typical Profile

Surface layer:
0 to 7 inches—very dark gray loam

Subsoil:
7 to 12 inches—dark grayish brown loam
12 to 17 inches—grayish brown loam

Underlying layer:
17 to 36 inches—brown and grayish brown, calcareous gravelly loamy sand
36 to 80 inches—grayish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 14 to 20 inches to gravelly material
Depth to high water table: 3.5 to 6.0 feet
Frequency of flooding: Rare
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Low
Content of organic matter: Moderate
Surface runoff: Low

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Divide soils on high flood plains
• Fordtown soils, which have gravelly material at a depth of 20 to 40 inches; on high flood plains
• The poorly drained Marysland soils on low flood plains

Similar inclusions:
• Soils that have a surface layer of gravelly loam
• Soils that are not subject to flooding
• Soils that contain less gravel throughout than the Renwash soil

Use and Management

Cropland

Main crops: Alfalfa, oats, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: The low available water capacity and agrochemical leaching
Management considerations:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
• Rotations that include grasses and legumes help to maintain the content of organic matter.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: 3s

Range site: Shallow to Gravel
Windbreak suitability group: 6G
Pasture suitability group: D2

SbB—Singsaas-Buse complex, 2 to 6 percent slopes

Composition

Singsaas and similar soils: 55 to 60 percent
Buse and similar soils: 25 to 35 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Singsaas—summits and backslopes; Buse—shoulders
Slope range: Singsaas—2 to 6 percent; Buse—3 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Singsaas

Surface layer:
0 to 9 inches—dark gray silty clay loam

Transitional layer:
9 to 13 inches—dark grayish brown and brown silty clay loam

Subsoil:
13 to 19 inches—brown and dark grayish brown silty clay loam
19 to 32 inches—light yellowish brown, calcareous loam
32 to 41 inches—light yellowish brown, calcareous loam with redoximorphic concentrations and depletions

Underlying layer:
41 to 52 inches—light brownish gray, calcareous loam with redoximorphic concentrations and depletions
52 to 80 inches—light yellowish brown, calcareous loam with redoximorphic concentrations and depletions

Buse

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 32 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
32 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Singsaas—10 to 20 inches to loamy glacial till; Buse—more than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Singsaas—high; Buse—moderately low
Surface runoff: Medium
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, calcareous Hamerly and McIntosh soils on footslopes
• The very poorly drained Parnell and poorly drained Tonka soils in basins
• The moderately well drained Waubay soils on footslopes

Similar inclusions:
• Soils that are deeper to glacial till than the Singsaas soil
• Soils that are similar to the Buse soil but have free carbonates at a greater depth

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Singsaas—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming.
• Wind stripcropping and field windbreaks help to control wind erosion.

• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Singsaas—2e; Buse—3e
Range site: Singsaas—Silty; Buse—Thin Upland
Windbreak suitability group: Singsaas—3; Buse—8
Pasture suitability group: Singsaas—F; Buse—G

ScA—Singsaas-Waubay silty clay loams, 0 to 2 percent slopes

Composition

Singsaas and similar soils: 55 to 65 percent
Waubay and similar soils: 25 to 30 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Singsaas—summits and backslopes; Waubay—footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

Singsaas

Surface layer:
0 to 9 inches—dark gray silty clay loam

Transitional layer:
9 to 13 inches—dark grayish brown and brown silty clay loam

Subsoil:
13 to 19 inches—brown and dark grayish brown silty clay loam
19 to 32 inches—light yellowish brown, calcareous loam
32 to 41 inches—light yellowish brown, calcareous loam with redoximorphic concentrations and depletions

Underlying layer:
41 to 52 inches—light brownish gray, calcareous loam with redoximorphic concentrations and depletions
52 to 80 inches—light yellowish brown, calcareous loam with redoximorphic concentrations and depletions

Waubay

Surface soil:
0 to 12 inches—dark gray silty clay loam

Subsoil:
12 to 25 inches—dark gray silty clay loam
25 to 32 inches—grayish brown, calcareous silty clay loam
32 to 41 inches—light brownish gray, calcareous silty clay loam

Underlying layer:
41 to 60 inches—light brownish gray, calcareous silty clay loam with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Singsaas—well drained; Waubay—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Singsaas—10 to 20 inches to loamy glacial till; Waubay—more than 40 inches to loamy glacial till
Depth to high water table: Singsaas—more than 6 feet; Waubay—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Singsaas—moderately slow; Waubay—moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Low
Other properties: Runoff water flows over the Waubay soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• The somewhat poorly drained, calcareous Hamerly and McIntosh soils on footslopes
• The very poorly drained Parnell and poorly drained Tonka soils in basins

Similar inclusions:
• Soils that are deeper to glacial till than the Singsaas soil
• Soils that have a surface layer of silt loam
• Soils that are similar to the Singsaas soil but contain more sand in the upper part

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Singsaas—1; Waubay—1
Range site: Singsaas—Silty; Waubay—Loamy Overflow
Windbreak suitability group: Singsaas—3; Waubay—1
Pasture suitability group: Singsaas—F; Waubay—K

ScB—Singsaas-Waubay silty clay loams, 1 to 6 percent slopes

Composition

Singsaas and similar soils: 55 to 70 percent
Waubay and similar soils: 20 to 25 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Singsaas—summits and backslopes; Waubay—footslopes
Slope range: Singsaas—2 to 6 percent; Waubay—1 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 500 acres

Typical Profile

Singsaas

Surface layer:
0 to 9 inches—dark gray silty clay loam

Transitional layer:
9 to 13 inches—dark grayish brown and brown silty clay loam

Subsoil:
13 to 19 inches—brown and dark grayish brown silty clay loam
19 to 32 inches—light yellowish brown, calcareous loam
32 to 41 inches—light yellowish brown, calcareous loam with redoximorphic concentrations and depletions

Underlying layer:
41 to 52 inches—light brownish gray, calcareous loam with redoximorphic concentrations and depletions
52 to 80 inches—light yellowish brown, calcareous loam with redoximorphic concentrations and depletions

Waubay

Surface soil:
0 to 12 inches—dark gray silty clay loam

Subsoil:
12 to 25 inches—dark gray silty clay loam
25 to 32 inches—grayish brown, calcareous silty clay loam
32 to 41 inches—light brownish gray, calcareous silty clay loam

Underlying layer:
41 to 60 inches—light brownish gray, calcareous silty clay loam with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Singsaas—well drained; Waubay—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Singsaas—10 to 20 inches to loamy glacial till; Waubay—more than 40 inches to loamy glacial till
Depth to high water table: Singsaas—more than 6 feet; Waubay—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Singsaas—moderately slow; Waubay—moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Singsaas—medium; Waubay—low
Other properties: Runoff water flows over the Waubay soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The well drained Buse soils on shoulders
• The somewhat poorly drained Badger soils on toeslopes

• The somewhat poorly drained, calcareous Hamerly and McIntosh soils on footslopes
• The very poorly drained Parnell and poorly drained Tonka soils in basins

Similar inclusions:
• Soils that are deeper to glacial till than the Singsaas soil
• Soils that are less wormworked than the Singsaas soil
• Soils that have a surface layer of silt loam
• Soils that are similar to the Singsaas soil but contain more sand in the upper part

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Singsaas—water erosion; Waubay—few limitations
Management considerations:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Singsaas—2e; Waubay—1
Range site: Singsaas—Silty; Waubay—Loamy Overflow
Windbreak suitability group: Singsaas—3; Waubay—1
Pasture suitability group: Singsaas—F; Waubay—K

ShD—Sioux-Renshaw complex, 9 to 15 percent slopes

Composition

Sioux and similar soils: 45 to 55 percent
Renshaw and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Moraines
Position on the landform: Sioux—summits and shoulders; Renshaw—backslopes
Slope range: 9 to 15 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Sioux

Surface layer:
0 to 7 inches—dark gray, calcareous gravelly loam

Transitional layer:
7 to 10 inches—grayish brown, calcareous gravelly loam

Underlying layer:
10 to 60 inches—pale brown, calcareous very gravelly sand

Renshaw

Surface layer:
0 to 7 inches—very dark gray loam

Subsoil:
7 to 12 inches—dark grayish brown loam
12 to 18 inches—brown loam

Underlying layer:
18 to 24 inches—brown, calcareous gravelly loamy sand
24 to 60 inches—brown, calcareous very gravelly loamy sand

Soil Properties and Qualities

Drainage class: Sioux—excessively drained; Renshaw—somewhat excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Sioux—6 to 14 inches to gravelly material; Renshaw—14 to 20 inches to gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Sioux—very rapid; Renshaw—moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Sioux—very low; Renshaw—low
Content of organic matter: Sioux—moderately low; Renshaw—moderate
Surface runoff: Sioux—low; Renshaw—high

Inclusions

Contrasting inclusions:
• The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on footslopes

Similar inclusions:
• Renshaw soils that have a surface layer of gravelly loam
• Soils that are similar to the major Renshaw soil but have less gravel throughout

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Sioux—water erosion, the very low available water capacity, and a high content of lime, which adversely affects the availability of plant nutrients; Renshaw—water erosion, the low available water capacity, and agrochemical leaching
Management considerations:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Sioux—6e; Renshaw—6e
Range site: Sioux—Very Shallow; Renshaw—Shallow to Gravel
Windbreak suitability group: Sioux—10; Renshaw—10
Pasture suitability group: Sioux—NS; Renshaw—NS

ShE—Sioux-Renshaw complex, 15 to 40 percent slopes

Composition

Sioux and similar soils: 45 to 55 percent
Renshaw and similar soils: 35 to 40 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Moraines
Position on the landform: Sioux—summits and shoulders; Renshaw—backslopes
Slope range: Sioux—15 to 40 percent; Renshaw—15 to 25 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Sioux

Surface layer:
0 to 7 inches—dark gray, calcareous gravelly loam

Transitional layer:
7 to 10 inches—grayish brown, calcareous gravelly loam

Underlying layer:
10 to 60 inches—pale brown, calcareous very gravelly sand

Renshaw

Surface layer:
0 to 7 inches—very dark gray loam

Subsoil:
7 to 12 inches—dark grayish brown loam
12 to 18 inches—brown loam

Underlying layer:
18 to 24 inches—brown, calcareous gravelly loamy sand
24 to 60 inches—brown, calcareous very gravelly loamy sand

Soil Properties and Qualities

Drainage class: Sioux—excessively drained; Renshaw—somewhat excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Sioux—6 to 14 inches to gravelly material; Renshaw—14 to 20 inches to gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Sioux—very rapid; Renshaw—moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Sioux—very low; Renshaw—low
Content of organic matter: Sioux—moderately low; Renshaw—moderate
Surface runoff: Sioux—medium; Renshaw—high

Inclusions

Contrasting inclusions:
• The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on footslopes

Similar inclusions:
• Renshaw soils that have a surface layer of gravelly loam
• Soils that are similar to the major Renshaw soil but have less gravel throughout

Use and Management

Rangeland

Suitability for crops: Unsuited
Management concerns: Sioux—water erosion, the very low available water capacity, the slope, and a high content of lime, which adversely affects the availability of plant nutrients; Renshaw—water erosion, the low available water capacity, and agrochemical leaching
Management considerations:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Sioux—7e; Renshaw—7e
Range site: Sioux—Very Shallow; Renshaw—Shallow to Gravel
Windbreak suitability group: Sioux—10; Renshaw—10
Pasture suitability group: Sioux—NS; Renshaw—NS

So—Southam silty clay loam, 0 to 1 percent slopes

Composition

Southam and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Position on the landform: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 5 to 400 acres

Typical Profile

Surface layer:
0 to 12 inches—dark gray, calcareous silty clay loam

Subsurface layer:
12 to 38 inches—dark gray, calcareous silty clay with redoximorphic concentrations

Underlying layer:
38 to 80 inches—gray, calcareous silty clay with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: 5 feet above to 1 foot below the surface
Flooding: None
Ponding: Frequent for very long periods
Permeability: Slow
Available water capacity: High
Content of organic matter: Very high
Surface runoff: Negligible
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The calcareous Cubden, Hamerly, and McIntosh soils on footslopes
• The poorly drained Minnewaukan soils on beaches
• Areas of open water

Similar inclusions:
• Soils that do not have dark colors more than 24 inches thick
• Soils that have less clay throughout than the Southam soil
• Soils that are deeper to free carbonates than the Southam soil
• Soils that have an organic layer overlying the surface layer

Use and Management

Wildlife habitat

Suitability for crops: Unsuited
Management concerns: Wetness and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Areas of this map unit should be maintained as wildlife habitat.

Interpretive Groups

Land capability classification: 8w
Range site: Not assigned
Windbreak suitability group: 10
Pasture suitability group: NS

Sp—Spottswood loam, 0 to 2 percent slopes

Composition

Spottswood and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Flood plains
Position on the landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 155 acres

Typical Profile

Surface layer:
0 to 10 inches—very dark gray loam

Subsoil:
10 to 17 inches—very dark gray loam
17 to 22 inches—light olive brown sandy loam
22 to 26 inches—light olive brown, calcareous sandy loam with redoximorphic concentrations

Underlying layer:
26 to 80 inches—light brownish gray, calcareous

gravelly sand with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches to gravelly material
Depth to high water table: 1.5 to 3.0 feet
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Content of organic matter: High
Surface runoff: Low

Inclusions

Contrasting inclusions:
• The poorly drained Castlewood soils on low flood plains
• Divide soils, which have carbonates within a depth of 16 inches; on high flood plains
• The well drained Fordtown soils on high flood plains
• The calcareous Lamoure soils on low flood plains

Similar inclusions:
• Soils that are moderately well drained
• Soils that have a surface layer of loam
• Soils that are not subject to flooding

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Flooding, high water table, the moderate available water capacity, and agrochemical leaching
Management considerations:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.
• Irrigation helps to overcome the limited ability of the soil to store water if an adequate and dependable supply of water is available.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: 2w
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

SrA—Strayhoss loam, 0 to 2 percent slopes

Composition

Strayhoss and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Position on the landform: Summits and backslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 250 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark grayish brown loam

Subsoil:
8 to 15 inches—brown loam
15 to 24 inches—yellowish brown silt loam
24 to 30 inches—light yellowish brown, calcareous silt loam

Underlying layer:
30 to 57 inches—light yellowish brown, calcareous loamy fine sand
57 to 80 inches—pale yellow, mottled, calcareous loamy very fine sand stratified with silt loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches to sandy material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: Moderate
Content of organic matter: High
Surface runoff: Low

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes

• Maddock and Egeland soils, which have more sand and less silt and clay in the upper part than the Strayhoss soil; on summits
• The moderately well drained Brookings, Embden, Svea, and Waubay soils on footslopes

Similar inclusions:
• Soils that are deeper to sand than the Strayhoss soil
• Soils that have glacial till below a depth of 40 inches
• Soils that have less sand and more silt in the upper part than the Strayhoss soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: The moderate available water capacity
Management considerations:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 2s
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

SrB—Strayhoss loam, 2 to 6 percent slopes

Composition

Strayhoss and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark grayish brown loam

Subsoil:
8 to 15 inches—brown loam
15 to 24 inches—yellowish brown silt loam
24 to 30 inches—light yellowish brown, calcareous silt loam

Underlying layer:
30 to 57 inches—light yellowish brown, calcareous loamy fine sand
57 to 80 inches—pale yellow, mottled, calcareous loamy very fine sand stratified with silt loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches to sandy material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: Moderate
Content of organic matter: High
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• Maddock and Egeland soils, which have more sand and less silt and clay in the upper part than the Strayhoss soil; on summits
• The moderately well drained Brookings, Embden, Svea, and Waubay soils on footslopes

Similar inclusions:
• Soils that are deeper to sand than the Strayhoss soil
• Soils that have glacial till below a depth of 40 inches
• Soils that have less sand and more silt in the upper part than the Strayhoss soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion and the moderate available water capacity
Management considerations:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 2e

Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

StB—Strayhoss-Maddock complex, 2 to 6 percent slopes

Composition

Strayhoss and similar soils: 60 to 65 percent
Maddock and similar soils: 25 to 30 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Position on the landform: Strayhoss—backslopes; Maddock—summits
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 400 acres

Typical Profile

Strayhoss

Surface layer:
0 to 8 inches—very dark grayish brown loam

Subsoil:
8 to 15 inches—brown loam
15 to 24 inches—yellowish brown silt loam
24 to 30 inches—light yellowish brown, calcareous silt loam

Underlying layer:
30 to 57 inches—light yellowish brown, calcareous loamy fine sand
57 to 80 inches—pale yellow, mottled, calcareous loamy very fine sand stratified with silt loam

Maddock

Surface layer:
0 to 7 inches—very dark gray sandy loam

Subsoil:
7 to 20 inches—brown loamy sand

Underlying layer:
20 to 40 inches—brown sand
40 to 80 inches—yellowish brown, calcareous sand and loamy sand

Soil Properties and Qualities

Drainage class: Strayhoss—well drained; Maddock—somewhat excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Strayhoss—20 to 40 inches to sandy material; Maddock—more than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Strayhoss—moderate; Maddock—rapid
Available water capacity: Strayhoss—moderate; Maddock—low
Content of organic matter: Strayhoss—high; Maddock—moderately low
Surface runoff: Strayhoss—medium; Maddock—very low

Inclusions

Contrasting inclusions:
• Doland soils, which have glacial till at a depth of 15 to 30 inches; on summits and backslopes
• The moderately well drained Embden soils on footslopes

Similar inclusions:
• Soils that have glacial till below a depth of 40 inches
• Soils that are similar to the Strayhoss soil but have less sand and more silt in the upper part
• Soils that are similar to the Strayhoss soil but are deeper to sand

Use and Management

Cropland

Main crops: Alfalfa, oats, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Strayhoss—water erosion and the moderate available water capacity; Maddock—wind erosion, water erosion, the low available water capacity, and agrochemical leaching
Management considerations:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Managing crop residue conserves moisture, helps to control erosion, and helps to maintain the content of organic matter and tilth.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: Strayhoss—2e; Maddock—3e

Range site: Strayhoss—Silty; Maddock—Sandy
Windbreak suitability group: Strayhoss—3; Maddock—5
Pasture suitability group: Strayhoss—F; Maddock—H

SvA—Svea loam, 0 to 2 percent slopes

Composition

Svea and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Position on the landform: Footslopes
Slope range: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 5 to 200 acres

Typical Profile

Surface layer:
0 to 10 inches—very dark gray loam

Subsoil:
10 to 18 inches—very dark grayish brown loam
18 to 28 inches—yellowish brown loam
28 to 36 inches—light yellowish brown, calcareous clay loam

Underlying layer:
36 to 80 inches—light yellowish brown, calcareous clay loam with redoximorphic depletions

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: 3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Low
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• The somewhat poorly drained, calcareous Hamerly soils on footslopes

Similar inclusions:
• Soils that have less sand and more silt in the upper part than the Svea soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 1
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

SwA—Swenoda-Lanona sandy loams, 0 to 2 percent slopes

Composition

Swenoda and similar soils: 45 to 55 percent
Lanona and similar soils: 35 to 40 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Swenoda—footslopes; Lanona—summits
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Swenoda

Surface layer:
0 to 8 inches—dark gray sandy loam

Subsoil:
8 to 18 inches—brown fine sandy loam
18 to 29 inches—light olive brown fine sandy loam
29 to 34 inches—light olive brown loam
34 to 50 inches—light yellowish brown, calcareous clay loam

Underlying layer:
50 to 60 inches—light yellowish brown, calcareous clay loam with redoximorphic concentrations

Lanona

Surface layer:
0 to 8 inches—dark gray sandy loam

Subsoil:
8 to 14 inches—grayish brown fine sandy loam
14 to 34 inches—yellowish brown fine sandy loam
34 to 50 inches—light yellowish brown, mottled, calcareous silt loam

Underlying layer:
50 to 80 inches—pale yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Swenoda—moderately well drained; Lanona—well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches to glacial till or glaciolacustrine sediments
Depth to high water table: Swenoda—2.5 to 4.0 feet; Lanona—more than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately rapid in the loamy sediments and moderately slow in the underlying material
Available water capacity: Moderate
Content of organic matter: High
Surface runoff: Low
Other properties: Runoff water flows over the Swenoda soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Maddock soils on summits
• Strayhoss soils, which have more silt and less sand in the upper part than the major soils; on backslopes

Similar inclusions:
• Soils that are deeper to glacial till
• Soils that have a surface layer of loam

Use and Management

Cropland

Main crops: Alfalfa, oats, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Wind erosion, the moderate available water capacity, and agrochemical leaching
Management considerations:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface help to control erosion and maintain the content of organic matter.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: Swenoda—2s; Lanona—2s
Range site: Swenoda—Sandy; Lanona—Sandy
Windbreak suitability group: Swenoda—5; Lanona—5
Pasture suitability group: Swenoda—H; Lanona—H

To—Tonka silty clay loam, 0 to 1 percent slopes

Composition

Tonka and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Position on the landform: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 13 inches—dark gray silty clay loam

Subsurface layer:
13 to 24 inches—gray silty clay loam

Subsoil:
24 to 30 inches—grayish brown silty clay loam with redoximorphic concentrations
30 to 40 inches—light brownish gray silty clay with redoximorphic concentrations

Underlying layer:
40 to 49 inches—light gray silty clay loam with redoximorphic concentrations
49 to 60 inches—light gray clay loam with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Poorly drained

Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: 1.0 foot above to 1.5 feet below the surface
Flooding: None
Ponding: Occasional for long periods
Permeability: Slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Negligible

Inclusions

Contrasting inclusions:
• The calcareous Cubden, Hamerly, and McIntosh soils on footslopes
• The very poorly drained Parnell soils in the center of basins

Similar inclusions:
• Soils that have a surface layer of silt loam

Use and Management

Cropland and pasture

Main crops: Corn and soybeans
Suitability for crops: Poorly suited
Management concerns: Ponding and high water table
Management considerations:
• In most years this soil is better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth and minimize surface compaction.
• Maintaining existing drainage systems helps to remove excess water.
• Permanent pasture or hayland species should be established.

Interpretive Groups

Land capability classification: 4w
Range site: Wet Meadow
Windbreak suitability group: 10
Pasture suitability group: B2

Tr—Trent silty clay loam, 0 to 2 percent slopes

Composition

Trent and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Position on the landform: Footslopes
Slope range: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 5 to 50 acres

Typical Profile

Surface soil:
0 to 13 inches—very dark gray silty clay loam

Subsoil:
13 to 20 inches—very dark gray silty clay loam
20 to 25 inches—very dark grayish brown silty clay loam
25 to 35 inches—grayish brown silty clay loam with redoximorphic concentrations and depletions
35 to 46 inches—pale yellow, calcareous silty clay loam with redoximorphic concentrations and depletions

Underlying layer:
46 to 60 inches—pale yellow, calcareous silt loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches to loamy glacial till
Depth to high water table: 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Low
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Chancellor soils on toeslopes
• Wakonda soils, which are calcareous within a depth of 16 inches; on footslopes
• The well drained Wentworth soils on backslopes

Similar inclusions:
• Soils that contain more sand and less silt than the Trent soil
• Soils that have a surface layer of silt loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 1
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

VaA—Venagro-Svea loams, 0 to 2 percent slopes

Composition

Venagro and similar soils: 60 to 65 percent
Svea and similar soils: 25 to 30 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Position on the landform: Venagro—summits and backslopes; Svea—footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Venagro

Surface layer:
0 to 9 inches—very dark gray loam

Subsoil:
9 to 15 inches—dark grayish brown silt loam
15 to 28 inches—brown silt loam
28 to 48 inches—light olive brown, calcareous loam
48 to 60 inches—light olive brown, calcareous loam with redoximorphic concentrations and depletions

Underlying layer:
60 to 80 inches—light yellowish brown, calcareous loam with redoximorphic concentrations

Svea

Surface layer:
0 to 10 inches—very dark gray loam

Subsoil:
10 to 18 inches—very dark grayish brown loam
18 to 28 inches—yellowish brown loam
28 to 36 inches—light yellowish brown, calcareous clay loam

Underlying layer:
36 to 80 inches—light yellowish brown, calcareous clay loam with redoximorphic depletions

Soil Properties and Qualities

Drainage class: Venagro—well drained; Svea—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Venagro—more than 40 inches to sandy material or loamy glacial till; Svea—more than 60 inches
Depth to high water table: Venagro—more than 6 feet; Svea—3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Low
Other properties: Runoff water flows over the Svea soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• Embden soils, which have more sand and less clay than the major soils; on footslopes
• Strayhoss soils, which have sand at a depth of 20 to 40 inches; on summits and backslopes

Similar inclusions:
• Soils that are similar to the Venagro soil but have less sand and more silt in the subsoil
• Soils that are similar to the Venagro soil but are shallower to glacial till

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Venagro—1; Svea—1
Range site: Venagro—Silty; Svea—Loamy Overflow

Windbreak suitability group: Venagro—3; Svea—1
Pasture suitability group: Venagro—F; Svea—K

VaB—Venagro-Svea loams, 1 to 6 percent slopes

Composition

Venagro and similar soils: 60 to 70 percent
Svea and similar soils: 20 to 25 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Venagro—summits and backslopes; Svea—footslopes
Slope range: Venagro—2 to 6 percent; Svea—1 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 150 acres

Typical Profile

Venagro

Surface layer:
0 to 9 inches—very dark gray loam

Subsoil:
9 to 15 inches—dark grayish brown silt loam
15 to 28 inches—brown silt loam
28 to 48 inches—light olive brown, calcareous loam
48 to 60 inches—light olive brown, calcareous loam with redoximorphic concentrations and depletions

Underlying layer:
60 to 80 inches—light yellowish brown, calcareous loam with redoximorphic concentrations

Svea

Surface layer:
0 to 10 inches—very dark gray loam

Subsoil:
10 to 18 inches—very dark grayish brown loam
18 to 28 inches—yellowish brown loam
28 to 36 inches—light yellowish brown, calcareous clay loam

Underlying layer:
36 to 80 inches—light yellowish brown, calcareous clay loam with redoximorphic depletions

Soil Properties and Qualities

Drainage class: Venagro—well drained; Svea—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Venagro—more than 40 inches to sandy material or loamy glacial till; Svea—more than 60 inches
Depth to high water table: Venagro—more than 6 feet; Svea—3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Venagro—medium; Svea—low
Other properties: Runoff water flows over the Svea soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• Egeland and Strayhoss soils, which have more sand in the upper part than the major soils; on summits and backslopes

Similar inclusions:
• Soils that are similar to the Venagro soil but have less sand and more silt in the subsoil
• Soils that are similar to the Venagro soil but are shallower to glacial till

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Venagro—water erosion; Svea—few limitations
Management considerations:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Venagro—2e; Svea—1
Range site: Venagro—Silty; Svea—Loamy Overflow
Windbreak suitability group: Venagro—3; Svea—1
Pasture suitability group: Venagro—F; Svea—K

VbA—Vienna-Brookings complex, 0 to 2 percent slopes

Composition

Vienna and similar soils: 60 to 65 percent
Brookings and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Vienna—summits and backslopes; Brookings—footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 2,000 acres

Typical Profile

Vienna

Surface layer:
0 to 9 inches—very dark grayish brown silt loam

Subsoil:
9 to 17 inches—light olive brown silt loam
17 to 32 inches—light yellowish brown, calcareous loam

Underlying layer:
32 to 41 inches—light yellowish brown, calcareous clay loam
41 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Brookings

Surface layer:
0 to 9 inches—very dark gray silty clay loam

Subsoil:
9 to 24 inches—very dark gray and dark grayish brown silty clay loam
24 to 30 inches—light olive brown and olive brown silty clay loam with redoximorphic concentrations and depletions
30 to 37 inches—light yellowish brown, calcareous clay loam with redoximorphic concentrations and depletions

Underlying layer:
37 to 80 inches—pale yellow, calcareous clay loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Vienna—well drained; Brookings—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Vienna—10 to 20 inches to loamy glacial till; Brookings—20 to 40 inches to loamy glacial till
Depth to high water table: Vienna—more than 6 feet; Brookings—3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Low
Other properties: Runoff water flows over the Brookings soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• The somewhat poorly drained, calcareous McIntosh soils on footslopes
• The very poorly drained Parnell and poorly drained Tonka soils in basins

Similar inclusions:
• Soils that are similar to the Vienna soil but are deeper to glacial till
• Soils that are similar to the Brookings soil but are deeper to glacial till

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Vienna—1; Brookings—1
Range site: Vienna—Silty; Brookings—Loamy Overflow
Windbreak suitability group: Vienna—3; Brookings—1
Pasture suitability group: Vienna—F; Brookings—K

VbB—Vienna-Brookings complex, 1 to 6 percent slopes

Composition

Vienna and similar soils: 65 to 70 percent
Brookings and similar soils: 20 to 25 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Position on the landform: Vienna—summits and backslopes; Brookings—footslopes
Slope range: Vienna—2 to 6 percent; Brookings—1 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 850 acres

Typical Profile

Vienna

Surface layer:
0 to 9 inches—very dark grayish brown silt loam

Subsoil:
9 to 17 inches—light olive brown silt loam
17 to 32 inches—light yellowish brown, calcareous loam

Underlying layer:
32 to 41 inches—light yellowish brown, calcareous clay loam
41 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Brookings

Surface layer:
0 to 9 inches—very dark gray silty clay loam

Subsoil:
9 to 24 inches—very dark gray and dark grayish brown silty clay loam
24 to 30 inches—light olive brown and olive brown silty clay loam with redoximorphic concentrations and depletions
30 to 37 inches—light yellowish brown, calcareous clay loam with redoximorphic concentrations and depletions

Underlying layer:
37 to 80 inches—pale yellow, calcareous clay loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Vienna—well drained; Brookings—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Vienna—10 to 20 inches to loamy glacial till; Brookings—20 to 40 inches to loamy glacial till
Depth to high water table: Vienna—more than 6 feet; Brookings—3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Vienna—medium; Brookings—low
Other properties: Runoff water flows over the Brookings soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Badger soils on toeslopes
- The calcareous Buse soils on shoulders
- The somewhat poorly drained McIntosh soils on footslopes
- The very poorly drained Parnell and poorly drained Tonka soils in basins

Similar inclusions:
- Soils that are similar to the Vienna soil but are deeper to glacial till
- Soils that are similar to the Brookings soil but are deeper to glacial till

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Vienna—water erosion; Brookings—few limitations
Management considerations:
- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming and grassed waterways (fig. 12) help to control water erosion, but slopes in some areas are too short or too irregular for contour farming.
- Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Vienna—2e; Brookings—1
Range site: Vienna—Silty; Brookings—Loamy Overflow
Windbreak suitability group: Vienna—3; Brookings—1
Pasture suitability group: Vienna—F; Brookings—K

VnB—Vienna-Buse complex, 2 to 6 percent slopes

Composition

Vienna and similar soils: 60 to 65 percent
Buse and similar soils: 25 to 30 percent
Contrasting inclusions: 5 to 15 percent

Figure 12.—Grassed waterways in an area of Vienna-Brookings complex, 1 to 6 percent slopes. The Brookings soil is on footslopes.

Setting

Landform: Till plains
Position on the landform: Vienna—summits and backslopes; Buse—shoulders
Slope range: Vienna—2 to 6 percent; Buse—3 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Vienna

Surface layer:
0 to 9 inches—very dark grayish brown silt loam

Subsoil:
9 to 17 inches—light olive brown silt loam
17 to 32 inches—light yellowish brown, calcareous loam

Underlying layer:
32 to 41 inches—light yellowish brown, calcareous clay loam
41 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Buse

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 32 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
32 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained

Depth to bedrock: Very deep
Depth to contrasting parent material: Vienna—10 to 20 inches to loamy glacial till; Buse—more than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Vienna—high; Buse—moderately low
Surface runoff: Medium
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• The moderately well drained Brookings soils on footslopes
• The somewhat poorly drained, calcareous McIntosh soils on footslopes

Similar inclusions:
• Soils that are similar to the Vienna soil but are deeper to glacial till
• Soils that are deeper to free carbonates than the Buse soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Vienna—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Vienna—2e; Buse—3e
Range site: Vienna—Silty; Buse—Thin Upland
Windbreak suitability group: Vienna—3; Buse—8
Pasture suitability group: Vienna—F; Buse—G

VnC—Vienna-Buse complex, 6 to 9 percent slopes

Composition

Vienna and similar soils: 45 to 55 percent
Buse and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Moraines
Position on the landform: Vienna—summits and backslopes; Buse—shoulders
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Vienna

Surface layer:
0 to 9 inches—very dark grayish brown silt loam

Subsoil:
9 to 17 inches—light olive brown silt loam
17 to 32 inches—light yellowish brown, calcareous loam

Underlying layer:
32 to 41 inches—light yellowish brown, calcareous clay loam
41 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Buse

Surface layer:
0 to 7 inches—dark gray, calcareous loam

Subsoil:
7 to 32 inches—light yellowish brown, mottled, calcareous clay loam

Underlying layer:
32 to 80 inches—light yellowish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Vienna—10 to 20 inches to loamy glacial till; Buse—more than 60 inches
Depth to high water table: More than 6 feet
Flooding: None

Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Vienna—high; Buse—moderately low
Surface runoff: Medium
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained Brookings soils on footslopes
• The somewhat poorly drained, calcareous McIntosh soils on footslopes

Similar inclusions:
• Soils that are similar to the Vienna soil but are deeper to glacial till
• Soils that are similar to the Buse soil but are deeper to free carbonates

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Vienna—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Vienna—3e; Buse—4e
Range site: Vienna—Silty; Buse—Thin Upland
Windbreak suitability group: Vienna—3; Buse—8
Pasture suitability group: Vienna—F; Buse—G

W—Water

• This map unit consists of naturally occurring basins of surface water.

Wa—Wakonda-Chancellor silty clay loams, 0 to 2 percent slopes

Composition

Wakonda and similar soils: 55 to 65 percent
Chancellor and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Wakonda—footslopes; Chancellor—toeslopes
Slope range: Wakonda—0 to 2 percent; Chancellor—0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 5 to 20 acres

Typical Profile

Wakonda

Surface layer:
0 to 8 inches—very dark gray silty clay loam

Subsoil:
8 to 13 inches—grayish brown, calcareous silty clay loam
13 to 24 inches—light gray, calcareous silty clay loam
24 to 35 inches—light yellowish brown, calcareous silty clay loam with redoximorphic concentrations and depletions

Underlying layer:
35 to 60 inches—pale yellow, calcareous silty clay loam with redoximorphic concentrations and depletions

Chancellor

Surface soil:
0 to 12 inches—very dark gray silty clay loam

Subsoil:
12 to 28 inches—very dark gray silty clay
28 to 38 inches—light olive gray silty clay with redoximorphic concentrations
38 to 43 inches—pale olive, calcareous silty clay loam with redoximorphic concentrations

Underlying layer:
43 to 60 inches—light gray, calcareous silty clay loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Wakonda—moderately well drained; Chancellor—somewhat poorly drained

Depth to bedrock: Very deep
Depth to contrasting parent material: Wakonda—more than 40 inches to loamy glacial till; Chancellor—more than 60 inches
High water table: Wakonda—at a depth of 2 to 4 feet; Chancellor—at the surface to 2 feet below the surface
Flooding: Wakonda—none; Chancellor—frequent for brief periods
Ponding: None
Permeability: Wakonda—moderate; Chancellor—slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Low
Other properties: The Wakonda soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained Trent soils on footslopes

Similar inclusions:
• Soils that are similar to the Wakonda soil but have more sand in the subsoil

Use and Management

Cropland

Main crops: Corn and soybeans
Suitability for crops: Well suited
Management concerns: Wakonda—wind erosion and the high content of lime, which adversely affects the availability of plant nutrients; Chancellor—flooding and the high water table
Management considerations:
• In most years these soils are better suited to late-planted crops than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Rotations that include grasses and legumes help to control erosion and maintain the content of organic matter, fertility, and tilth.
• Maintaining existing drainage systems helps to remove excess water on the Chancellor soil.
• Restricting tillage when the Chancellor soil is wet and deferring grazing during wet periods help to prevent soil compaction.

Interpretive Groups

Land capability classification: Wakonda—2s; Chancellor—2w
Range site: Wakonda—Limy Subirrigated; Chancellor—Loamy Overflow
Windbreak suitability group: Wakonda—1K; Chancellor—2
Pasture suitability group: Wakonda—F; Chancellor—A

Wb—Waubay silty clay loam, 0 to 2 percent slopes

Composition

Waubay and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Position on the landform: Footslopes
Slope range: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 5 to 70 acres

Typical Profile

Surface soil:
0 to 12 inches—dark gray silty clay loam

Subsoil:
12 to 25 inches—dark gray silty clay loam
25 to 32 inches—grayish brown, calcareous silty clay loam
32 to 41 inches—light brownish gray, calcareous silty clay loam

Underlying layer:
41 to 60 inches—light brownish gray, calcareous silty clay loam with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches to loamy glacial till
Depth to high water table: 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Low
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes

• The somewhat poorly drained Cubden soils on footslopes
• The poorly drained Tonka soils in basins

Similar inclusions:
• Soils that are shallower to glacial till than the Waubay soil
• Soils that have a surface layer of silt loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: 1
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

WeA—Wentworth-Trent silty clay loams, 0 to 2 percent slopes

Composition

Wentworth and similar soils: 55 to 70 percent
Trent and similar soils: 20 to 25 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Wentworth—backslopes; Trent—footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

Wentworth

Surface layer:
0 to 8 inches—very dark gray silty clay loam

Subsoil:
8 to 18 inches—dark grayish brown silty clay loam
18 to 27 inches—brown silty clay loam
27 to 37 inches—light yellowish brown, calcareous silt loam
37 to 48 inches—pale yellow, mottled, calcareous silt loam

Underlying layer:
48 to 60 inches—pale yellow, mottled, calcareous silt loam

Trent

Surface soil:
0 to 13 inches—very dark gray silty clay loam

Subsoil:
13 to 20 inches—very dark gray silty clay loam
20 to 25 inches—very dark grayish brown silty clay loam
25 to 35 inches—grayish brown silty clay loam with redoximorphic concentrations and depletions
35 to 46 inches—pale yellow, calcareous silty clay loam with redoximorphic concentrations and depletions

Underlying layer:
46 to 60 inches—pale yellow, calcareous silt loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Wentworth—well drained; Trent—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches to loamy glacial till
Depth to high water table: Wentworth—more than 6 feet; Trent—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff: Low
Other properties: Runoff water flows over the Trent soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Chancellor soils on toeslopes
• Wakonda soils, which are calcareous within a depth of 16 inches; on footslopes
• The very poorly drained Worthing soils in basins

Similar inclusions:
• Soils that contain more sand and less silt
• Soils that have a surface layer of silt loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain the content of organic matter and tilth.

Interpretive Groups

Land capability classification: Wentworth—1; Trent—1
Range site: Wentworth—Silty; Trent—Loamy Overflow
Windbreak suitability group: Wentworth—3; Trent—1
Pasture suitability group: Wentworth—F; Trent—K

Wo—Worthing silty clay loam, 0 to 1 percent slopes

Composition

Worthing and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Position on the landform: Basins
Slope range: 0 to 1 percent
Shape of area: Oval
Size of area: 3 acres

Typical Profile

Surface layer:
0 to 10 inches—dark gray silty clay loam

Subsoil:
10 to 45 inches—dark gray silty clay
45 to 54 inches—dark gray and light gray silty clay with redoximorphic concentrations and depletions
54 to 60 inches—light gray silty clay loam with redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: 2 feet above to 1 foot below the surface
Flooding: None
Ponding: Frequent for long periods
Permeability: Slow
Available water capacity: High
Content of organic matter: High
Surface runoff: Negligible

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Chancellor soils on toeslopes
• The moderately well drained Trent and Wakonda soils on footslopes

Similar inclusions:
• Soils that have a surface layer of silty clay

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Wetness, high water table, and soil compaction
Management considerations:
• Proper grazing management helps to maintain plant vigor.
• Restricting grazing during wet periods helps to minimize soil compaction.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: 5w
Range site: Shallow Marsh
Windbreak suitability group: 10
Pasture suitability group: B2

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

The soils in the survey area are assigned to various interpretive groups at the end of each map unit description and in some of the tables. The groups for each map unit also are shown in the section "Interpretive Groups," which follows the tables at the back of the survey.

Crops and Pasture

General management needed for crops and for pasture and hayland is suggested in this section. The crops best suited to the soils, including some not commonly grown in the survey area, are identified; soil productivity ratings and the estimated yields of the main crops and hay and pasture plants are listed for each soil; the system of land capability classification used by the Natural Resources Conservation Service is explained; and prime farmland is described.

Planners developing management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service, the South Dakota Cooperative Extension Service, and the Agricultural Experiment Station at South Dakota State University.

Crops

Jeffrey A. Hemenway, conservation agronomist, Natural Resources Conservation Service, helped prepare this section.

About 64 percent of the acreage in Brookings County is used for cultivated crops (U.S. Department of Commerce, 1999). The major crops are corn, soybeans, oats, spring wheat, and barley. Sunflowers, flax, winter wheat, and rye also are grown. Spring wheat and soybeans are grown as cash crops. Corn, oats, and barley are grown as cash crops and as feed for livestock.

The potential of the soils in Brookings County for increased crop production is good. Crop production could be increased considerably by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology. The paragraphs that follow describe the management needed on the cropland in the county.

Water erosion is a major problem on more than half of the cropland in Brookings County. Where the slope

is more than 2 percent, water erosion is a hazard in areas of Barnes, Buse, Kranzburg, Poinsett, Vienna, and other soils.

Loss of the surface layer through water erosion reduces the productivity of the soil and can result in the pollution of surface water sources by sediment. Productivity is also reduced when the more fertile surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a thin surface layer, such as Buse soils. Erosion also reduces the productivity of soils that tend to be droughty, such as Renshaw soils.

Water erosion can accelerate the pollution of surface water sources by increasing runoff and sediments and the nutrients and pesticides associated with those sediments. Phosphorus loading of surface waters by surface runoff and sediments is a major concern in South Dakota. Measures that control water erosion minimize the pollution of surface water sources by sediment and preserve the quality of water for fish and wildlife and for recreational and municipal uses. They also reduce the amount of fertilizer needed in cropped areas by helping to prevent the removal of plant nutrients.

A cropping sequence that keeps a plant cover on the soil surface for extended periods holds soil losses to an amount that will not reduce the productive capacity of the soils. If a plant cover cannot protect the soil, careful management of crop residue is essential. Minimizing tillage and leaving crop residue on the surface increase the rate of water infiltration, reduce the runoff rate, and help to control erosion.

Terraces and diversions reduce the length of slopes and thus reduce the runoff rate and the hazard of erosion on the gently sloping Barnes, Kranzburg, and Vienna soils (fig. 13). Many areas of Buse and Renshaw soils are poorly suited to terraces and diversions because of short, irregular slopes or because of an unfavorable subsoil that would be exposed in terrace channels.

Wind erosion is a slight to severe hazard in many areas of the county. The hazard of wind erosion is greatest on soils that have a surface layer of sandy loam, such as Allivar, Egeland, and Maddock soils. Soils that have a high content of lime in the surface layer, such as Buse, Divide, and Lamoure soils, also are highly susceptible to wind erosion. These soils can be damaged in a few hours if the winds are strong and the soils are dry and are not protected by a plant cover or surface mulch. Surface crusting can also be a problem in areas of these soils. Wind erosion can be controlled by maintaining the content of organic matter, maintaining an adequate plant cover or a cover of crop residue, stripcropping, and keeping the surface rough. Planting windbreaks of suitable trees and shrubs also is effective in controlling wind erosion.

Information about measures that control erosion on each kind of soil is included in the Field Office Technical Guide, which is available in the local office of the Natural Resources Conservation Service.

Wetness is the major management concern in areas of the poorly drained Lamoure, Lowe, Ludden, and Marysland soils. These soils are better suited to late-planted crops, such as corn and soybeans, than to some other crops. Maintaining existing drainage systems helps to remove excess water.

The moderately well drained Brookings and Waubay soils are on footslopes on till plains and moraines and receive additional moisture when water runs off the higher adjacent soils. The moderately well drained La Prairie and LaDelle soils are on flood plains and occasionally receive additional moisture when streams overflow. Tillage and planting are delayed in the spring during wet years; in most years, however, natural drainage is adequate and the additional moisture is beneficial for crops.

Soil fertility helps to determine the yields that can be obtained from the soil. Fertility can be improved by applying fertilizer and animal wastes and by including grasses and legumes in the cropping system. In areas of soils that have a high content of lime in the surface layer, such as Buse, Divide, and Lamoure soils, the kinds and amounts of fertilizer applied should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The South Dakota Cooperative Extension Service or the Agricultural Experiment Station at South Dakota State University can help in determining the kinds and amounts of fertilizer needed, the appropriate application method, and the correct timing of application. The appropriate methods may vary, depending on the crop, the soil, climatic conditions, and the location of the field in relation to the depth to an aquifer and the distance to surface water sources. In steep areas and in areas of soils that are susceptible to leaching, careful monitoring of the use of agrochemicals can help to prevent environmental problems. The leaching of nitrates and pesticides is most commonly associated with soils that have moderately rapid, rapid, or very rapid permeability, such as Allivar, Arlo, Arvilla, Dimo, Divide, Egeland, Embden, Enet, Estelline, Fordville, Goldsmith, Maddock, Renshaw, Renwash, and Spottswood soils. Using a nutrient and pesticide management plan can help to control the leaching potential. Such a plan involves following pesticide labeling and fertility recommendations based on soil nutrient tests. The key

Figure 13.—Parallel terraces and diversions in an area of Vienna-Brookings complex, 1 to 6 percent slopes.

to preventing large nitrogen losses to ground water is minimizing the additions of nutrients that are not used by the present crops. Applying nitrogen close to the time when the crops will use it also can reduce the risk of losses by shortening the time available for leaching (Gerwing and Gelderman, 1993). Soils in steep areas have a high potential for water erosion, which can also affect the quality of surface water.

Soil tilth is an important factor in the germination of seeds and the infiltration of water into the soil. Soils that have good tilth are granular and porous. If tilled when wet, Badger, Lamoure, and Ludden soils tend to be very cloddy when they dry. As a result of the cloddiness, preparing a good seedbed is difficult. These soils dry out slowly in the spring and can be difficult to till during wet periods. Tilling in a timely manner, including grasses and legumes in the cropping system, and incorporating crop residue into the soil improve tilth and increase the rate of water infiltration.

Soil compaction also is an important factor in soil management. It can occur when important physical soil properties, such as pore space, are degraded. Soil compaction results from weight on the soil pushing the soil particles together. When compaction occurs in the surface layer or subsoil, aeration is impaired and plant roots have more difficulty pushing through the soil to reach water and nutrients. Other soil conditions that affect compaction are wet conditions and clayey textures in the surface layer and subsoil.

Management measures that improve soil tilth and minimize surface compaction include using high-residue crops in the rotation a high percentage of the time, preventing trampling by livestock during wet periods, deferring the use of equipment during wet periods, leaving as much residue as possible on or

near the surface, and eliminating unnecessary tillage trips. The timing of farming activities is critical. If compaction has occurred, it can be reduced through ripping or deep plowing. Tilth and compaction are especially important in areas of clayey soils, such as Badger, Castlewood, Chancellor, Clamo, and Ludden soils, and in claypan, or sodium-affected, soils, such as Cavour soils.

Sodium-affected soils create some additional management problems. They have a slow rate of water infiltration, and most of them are less productive than other soils because they have a lower content of organic matter. Also, they have high pH values, which limit nutrient availability. The penetration of roots and moisture can be restricted by the dense, compact subsoil in these soils. The management of sodium-affected soils should always include tilling in a timely manner; minimizing tillage; leaving crop residue on the surface, which helps to maintain the content of organic matter; and maintaining tilth. Including grasses and legumes in the rotation helps to maintain the content of organic matter, fertility, and tilth. Chiseling and subsoiling when the soil is dry can increase the rate of water infiltration.

Field crops suited to the soils and climate of the survey area include small grain and row crops. Oats and spring wheat are the main small grain crops. Barley, flax, and rye also are grown. Corn and soybeans are the main row crops. Corn is grown mainly for grain, but some is harvested for silage. The acreage planted to sunflowers has recently been decreasing in the county.

All of the commonly grown and climatically adapted crops are suited to the very deep, well drained or moderately well drained soils, such as Brookings, Kranzburg, La Prairie, LaDelle, Poinsett, and Waubay soils. Estelline and Fordville soils are better suited to early maturing small grain than to the deeper rooted, late-maturing crops, such as corn. The porous underlying material limits the available water capacity and the depth to which roots can develop. Sandy soils, such as Allivar, Egeland, and Maddock soils, also are better suited to small grain, which provides better protection against wind erosion than row crops.

Much of the acreage of Estelline, Fordtown, and Fordville soils is irrigated. Alfalfa and corn are the main irrigated crops. The main management concerns in irrigated areas are preserving the quality of water, conserving soil moisture, and improving fertility and tilth. All of the irrigation presently is applied by sprinkler systems. The water for these systems is pumped from a shallow aquifer that underlies most of the irrigated soils. These soils have a subsoil of sand or sand and gravel, in which the potential for leaching of agrochemicals into ground water aquifers is high.

Pasture and Hayland

David W. Schmidt, range conservationist, Natural Resources Conservation Service, helped prepare this section.

Pasture and hayland are used for the production of adapted domesticated perennial forage plants to be grazed by livestock or harvested for hay. These forage plants may be either native or introduced species and may be seeded alone or in mixtures. Generally, these species are established as part of a long-term forage program, but in some areas legumes or grasses have been established as part of a short-term crop rotation.

Currently, about 7 percent of the county is classified as pasture and hayland (U.S. Department of Commerce, 1999). This acreage supplies a major portion of the forage for livestock. It includes areas that formerly supported native vegetation but have been invaded by introduced tame grasses, such as smooth bromegrass, because of overgrazing. Managing these sites as native rangeland is no longer practical in many cases. Because of overgrazing, improper management, and poor agronomic practices, much of the pasture or hayland is presently producing well below its potential.

Proper management of pasture and hayland is needed to obtain maximum sustained yields. Proper stocking rates allow the pasture plants to retain their vigor. Overgrazing results in depletion of the root systems of the pasture plants. If continued overgrazing is allowed, the plants will eventually die out and be replaced by less desirable species and by weeds. A planned grazing system that includes periods of adequate rest or deferment for the key pasture species improves plant vigor and thus improves production. Including rest periods between periods of grazing allows the pasture plants to regrow and replenish their energy reserves. Harvesting hay at the proper stage of plant growth also helps to maintain plant vigor. Generally, the plants should be allowed to grow to early or mid bloom stage before they are harvested. Grazing pasture species at the proper stage of growth also increases production. The plants should not be grazed before they have produced enough leaf material to replenish stored energy reserves. Generally, the plants should be allowed to grow to a height of 8 to 14 inches before grazing is initiated. The proper height depends on the species being managed. If the plants become too tall or mature before grazing is allowed, the quality and quantity of

the forage can be affected. Also, allowing the plants to regrow before the first killing frost provides adequate energy reserves for survival during the winter and for the initiation of regrowth in the spring. Allowing regrowth also increases the ability of the plants to trap snow, thereby increasing soil moisture.

Pasture and hayland species can be divided into two broad categories. Cool-season species begin their growth early in the spring and reach maturity in early summer. If soil moisture is adequate, they may regrow in the fall when temperatures cool. Cool-season plants include smooth bromegrass, intermediate wheatgrass, and alfalfa. Warm-season species begin growth in early summer. Warm-season species include big bluestem and switchgrass.

Proper management includes the periodic reestablishment of pasture and hayland. The length of time that pasture or hayland remains productive depends on the plant species, the type of soil, climatic factors, and management techniques. Generally, many of the tame species should be replaced every 5 to 10 years. Native species that are adapted to the site generally remain productive for an extended period of time, depending on the kind of management applied. Species selection should be based on the type of soil and on producer needs. Using improved varieties can result in increased production, improved forage quality, and improved stand establishment and longevity of the stand.

Maintaining soil fertility is an important management concern. Applications of fertilizer should be based on the results of soil tests. Care should be taken to prevent the contamination of water supplies. Proper levels of fertilizer can increase production, increase the longevity of the stand, and improve the quality of the forage. Planting legumes, such as alfalfa, in combination with grasses increases the nitrogen level and thus helps to meet the nutrient needs of grass species.

Weeds can be a problem unless proper management techniques are applied. Allowing overgrazing, failing to maintain soil fertility, and selecting species that are not adapted to the site can increase the extent of weeds in areas of pasture and hayland. Weeds should be controlled within economical and environmental constraints.

If areas of clayey soils are grazed during wet periods, surface compaction can be a concern.

The soils in the county have been assigned to pasture suitability groups. These groups are listed at the end of each map unit description and in the section “Interpretive Groups.” Pasture suitability groups are based primarily on the suitability of the soil for certain pasture or hayland species, on management needs, and on potential productivity. The principal criteria for assigning a soil to a pasture suitability group include depth, drainage class, texture, structure, permeability, available water capacity, position on the landform, and special internal features. Detailed interpretations for each pasture suitability group in the county are provided in the Field Office Technical Guide, which is available in the local office of the Natural Resources Conservation Service. General descriptions of the pasture suitability groups in this county are provided in the following paragraphs. The descriptions include limitations affecting the use of the soils for pasture or hayland and a list of suitable plant species. The species are selected based on yield potential, adaptability to the site, palatability, and relative ease of establishment.

Group A.—The soils in this group receive additional moisture from runoff or flooding. All climatically adapted grasses and legumes are suitable, but only plants that are capable of utilizing the extra moisture are recommended.

The soils in this group are artificially drained or have a water table that is seasonally high for only short periods and thus does not adversely affect plant growth. Examples are Badger, Lamoure, Lowe, and Minnewaukan soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, creeping foxtail, indiangrass, intermediate wheatgrass, reed canarygrass, smooth bromegrass, orchardgrass, and switchgrass. Maintaining plant vigor and maintaining good soil tilth are the major management concerns. Some of the soils in the group are calcareous to the surface. This characteristic can limit the availability of plant nutrients. Proper grazing use, including deferred grazing and timely harvesting, helps to maintain plant vigor. Applications of fertilizer may also be needed. Surface compaction may be a concern during wet periods. Deferring use during these periods helps to minimize compaction and maintain soil tilth.

Group B1.—The soils in this group receive additional moisture from runoff or flooding. Because of excess moisture, the selection of climatically adapted grasses is limited to water-tolerant species.

The soils in this group are not artificially drained and do not have a water table that is seasonally high for prolonged periods. Examples are Ludden, Marysland, and Rauville soils. The species that are most suitable in areas of these soils include creeping foxtail and reed canarygrass. The main management concern is surface compaction, which can result from harvesting or grazing during periods when the soils

are saturated. Deferring grazing or delaying harvesting can minimize surface compaction and improve plant vigor.

Group B2.—The soils in this group receive additional moisture from runoff. Because of excess moisture, the selection of climatically adapted grasses is limited to water-tolerant species.

The soils in this group are not artificially drained. They are mainly very deep and are somewhat poorly drained to very poorly drained. Examples are Oldham, Parnell, and Tonka soils. The species that are most suitable in areas of these soils include creeping foxtail and reed canarygrass. The main management concern is surface compaction, which can result from harvesting or grazing during periods when the soils are saturated. Deferring grazing or delaying harvesting can minimize surface compaction and improve plant vigor.

Group C.—The soils in this group have a claypan subsoil in which permeability is slow or very slow. They typically have a high content of soluble salts in the lower part of the subsoil and in the underlying material. An unfavorable root zone limits the selection and productivity of climatically adapted grasses and legumes.

Cavour soils are in this group. The species that are most suitable in areas of these soils include alfalfa, crested wheatgrass, green needlegrass, intermediate wheatgrass, pubescent wheatgrass, smooth bromegrass, and western wheatgrass. The major management concerns are the accumulation of excess salts, surface compaction, and a restricted rate of water infiltration. High soil pH is also a major limiting feature in areas of these soils. Proper grazing use, including deferred grazing and proper hayland management, helps to maintain a healthy plant community and minimizes soil-related management problems. Applications of fertilizer may also be needed.

Group D1.—The soils in this group have a moderately deep root zone and a limited available water capacity, which restrict the selection of climatically adapted grasses and legumes.

The soils in this group are excessively drained to somewhat poorly drained and are moderately deep over sand and gravel. The somewhat poorly drained soils and some of the moderately well drained soils have a water table that is seasonally high for short periods and are calcareous at or near the surface. Typical soils in this group are Divide, Estelline, and Fordville soils. The species that are most suitable in areas of these soils include alfalfa, intermediate wheatgrass, and smooth bromegrass. The major management concerns are maintaining plant vigor and minimizing leaching through proper use of agrochemicals. Proper hayland management and proper grazing use, including deferred grazing or a planned grazing system, help to maintain plant vigor. Applications of fertilizer may also be needed.

Group D2.—The soils in this group have a shallow root zone and a limited available water capacity, which restrict the selection of climatically adapted grasses and legumes.

The soils in this group are excessively drained to moderately well drained and are shallow over sand and gravel. Allivar and Renshaw soils are examples. The species that are most suitable in areas of these soils include crested wheatgrass and pubescent wheatgrass. Maintaining the plant community can be difficult because of the extreme droughtiness and the shallow root zone. Minimizing leaching through proper use of agrochemicals is also a concern. Proper grazing use, deferred grazing, a planned grazing system, and timely harvesting help to maintain plant vigor.

Group F.—The soils in this group are suited to all climatically adapted grasses and legumes, but bunch-type grass species are not recommended in areas where the slope is 6 percent or more.

The soils in this group include Barnes, Brandt, Kranzburg, McIntosh, Poinsett, Singsaas, and Vienna soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, green needlegrass, indiangrass, intermediate wheatgrass, smooth bromegrass, switchgrass, and little bluestem. The major management concerns are maintaining plant vigor and maintaining good tilth. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to maintain tilth. Applications of fertilizer may also be needed.

Group G.—The soils in this group are calcareous within a depth of 10 inches. They range from gently sloping to moderately steep. The selection and productivity of climatically adapted grasses and legumes are limited by the slope, the high content of lime, and the hazard of erosion.

Buse soils are typical of the soils in this group. The species that are most suitable in areas of these soils include alfalfa, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, smooth bromegrass, little bluestem, and sideoats grama. The major management concerns are maintaining plant vigor and controlling erosion. The risk of pollution by agrochemicals in runoff from areas of these soils is also a concern. Proper grazing use, deferred grazing,

a planned grazing system, and proper hayland management improve plant vigor and help to control erosion. Applications of fertilizer may also be needed.

Group H.—The soils in this group are susceptible to erosion. Also, a limited available water capacity restricts the selection and productivity of climatically adapted grasses and legumes.

The soils in this group include Egeland, Embden, Lanona, and Maddock soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, indiangrass, intermediate wheatgrass, smooth bromegrass, switchgrass, prairie sandreed, little bluestem, and sideoats grama. The major management concerns are maintaining plant vigor and controlling erosion. The risk of pollution by agrochemicals is also a major concern. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to control erosion. Applications of fertilizer may also be needed.

Group J.—The soils in this group are characterized by excessive salinity and alkalinity, which severely limit the selection and productivity of climatically adapted grasses and legumes. Also, the soils have a water table that is seasonally high for prolonged periods.

The soils in this group are mainly very deep and are poorly drained or very poorly drained. The saline Ludden soil is typical of the soils in this group. The species that are most suitable in areas of this soil include tall wheatgrass and western wheatgrass. The major management concern is maintaining a desirable plant community. Surface compaction is also a concern if grazing or harvesting is allowed during periods when the soil is saturated. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management help to maintain plant vigor and ensure the survival of the stand.

Group K.—The soils in this group receive additional moisture from runoff. They have a thick, dark surface layer. They are suited to all of the climatically adapted grasses and legumes.

The soils in this group are mainly very deep, are well drained or moderately well drained, and have medium or moderately fine textures. They include Brookings, La Prairie, Svea, and Waubay soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, creeping foxtail, indiangrass, intermediate wheatgrass, reed canarygrass, smooth bromegrass, and switchgrass. The major management concerns are maintaining plant vigor and maintaining good tilth. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to maintain tilth. Applications of fertilizer may also be needed.

Group NS.—The soils in this group are generally not suitable for pasture or hayland plantings because they are very shallow to gravel, are sandy and have a low content of organic matter, are very strongly saline or alkaline, or are clayey and have a dense subsoil. Also included in this group are areas of soils that are so steep that pasture planting is not feasible because of the erosion hazard and the difficulty in establishing erosion-control practices.

Productivity Ratings

Soil productivity ratings are relative ratings of the ability of a soil to produce a particular crop. They are useful for estimating long-term average crop yields, for comparing the production capacity of soils, and in various economic analyses. The productivity ratings of the soils in Brookings County are shown in table 5.

Productivity ratings are based on soil properties that are important to crop production. The experience of soil scientists, conservationists, and university researchers is used to develop the ratings. Results from field trials and demonstrations and the records and experience of producers also are considered.

The ratings developed for this survey are comparative ratings, and they apply to the detailed soil map units in Brookings County. The ratings are for local use and may differ from those developed for adjacent or nearby counties.

The data used to determine productivity ratings include crop and range yields, range composition, and other soils information published in this soil survey. Forage use values were provided by the South Dakota Agricultural Experiment Station at South Dakota State University. Three steps are used to calculate the productivity ratings (Malo, 1996). The first step is to determine a comparative crop rating for each map unit that is suitable for crop production. In the second step, the amount of usable grass (range) forage available for each map unit is determined (total range yield x forage use value factor). Since not all native forage is usable by livestock, a forage use value factor (based on the plant species that occur) is calculated for each soil series. The third step is to determine the grass/range rating for each map unit. Grass/range ratings are equated to crop ratings by using a balance point factor. The rating is for potential palatable native vegetation.

Because these productivity ratings are based on comparisons of physical and chemical properties of soils, the rating of one soil relative to another soil should not change as a result of fluctuations in

economic conditions or advancements in technology. Also, the potential yield advantage of one soil over another generally does not change when a new form of fertilizer, a new grain variety, a new tillage system, or a new pest management program is developed.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, extension agents, and researchers. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service, the South Dakota Cooperative Extension Service, or the South Dakota Agricultural Experiment Station at South Dakota State University can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for pasture and hayland, rangeland, or woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (USDA, 1961). Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have few limitations or hazards that restrict their use.

Class 2 soils have moderate limitations or hazards that reduce the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations or hazards that reduce the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations or hazards that reduce the choice of plants or that require very careful management, or both.

Class 5 soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class 6 soils have severe limitations or hazards that make them generally unsuitable for cultivation.

Class 7 soils have very severe limitations or hazards that make them unsuitable for cultivation.

Class 8 soils and miscellaneous areas have limitations or hazards that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation; *s* shows that the soil has a root zone limitation mainly because it is too shallow, too sandy, or too rocky; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations or hazards. Class 5 contains only the subclasses indicated by *w, s,* or *c* because the soils in class 5 are subject to little

or no erosion. They have other limitations or hazards that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of the map units in the survey area is given in the detailed soil map unit descriptions and in the “Interpretive Groups” section, which follows the tables at the back of the survey.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation’s short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation’s prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 283,554 acres in the survey area, or 55 percent of the total acreage, meets the soil requirements for prime farmland. This land is scattered throughout the county. Almost all the prime farmland is used for crops, mainly corn, soybeans, oats, and alfalfa.

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 7. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading “Detailed Soil Map Units.”

Rangeland

David W. Schmidt, range conservationist, Natural Resources Conservation Service, helped prepare this section.

Rangeland supports native vegetation suitable for grazing or browsing. It includes areas where native vegetation has been reestablished. The vegetation is mainly grasses, grasslike plants, forbs, or shrubs. The amounts and kinds of native vegetation in any one area are determined by the soil, topography, climate, past use, and management.

All of the county was rangeland before the first permanent settlers arrived. Currently, about 15 percent of the county supports native vegetation (USDA, 1987). This rangeland supplies a portion of the forage for livestock in the county. Approximately 69 percent of the farm and ranch income in the county is derived from the sale of livestock and livestock products (U.S. Department of Commerce, 1999). Most of the livestock enterprises are cow-calf operations. Some are yearling operations, and some combine their cow herds with yearlings. This latter practice permits greater flexibility in adjusting livestock numbers during periods of drought. Sheep are raised in limited numbers throughout the county and are commonly run in combination with cow herds. The rangeland is generally grazed from May to October. The forage provided by rangeland is generally supplemented by crop aftermath and tame pasture plants, such as intermediate wheatgrass, orchardgrass, and smooth bromegrass. In winter the forage is supplemented by protein concentrate and hay.

Brookings County is part of the tall grass prairie. The native vegetation is dominated by tall and mid grasses and forbs (Baumberger, 1977). Common tall grass species include big bluestem, switchgrass, and

prairie dropseed. Mid grasses include little bluestem, sideoats grama, and needlegrasses. Goldenrod and prairie-clover are common forbs. The tall grass prairie consists of cool- and warm-season plants, which provide high-quality forage throughout the growing season. The cool-season plants grow mostly during April, May, and June and include such plants as porcupinegrass. The warm-season plants grow mostly during June, July, and August and include such plants as big bluestem. The cool-season grasses may start growing again in September and October if rainfall is adequate.

The native vegetation in many parts of the county is producing below its potential because of past management. The tall grasses and some of the mid grasses have been replaced by less desirable plants. In many areas of the county, the past misuse of the native vegetation has resulted in an invasion of cool-season tame grasses, namely smooth bromegrass and Kentucky bluegrass. As a result, the amount of available forage is reduced. In most areas, however, enough of the original plants remain for the reestablishment of high-quality native plants if good management practices are applied.

Range Sites and Condition Classes

Different kinds of soil vary in their capacity to produce native vegetation. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table also are important. Soils that produce approximately the same kinds, amounts, and proportions of native vegetation make up a range site. The potential native vegetation on a range site is the stabilized plant community that the site is capable of producing. It consists of the plants that were growing on the site when the region was settled. This plant community maintains itself and changes very little as long as the environment remains unchanged. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil maps.

The plants within the native plant community are sometimes grouped as decreasers, increasers, and invaders, depending on their response to grazing pressure. Decreasers are plants that respond to overgrazing by decreasing in abundance. They generally are the most productive plants and the ones most preferred by the grazing animals. Increasers are plants that respond to grazing pressure, at least initially, by increasing in amount as the more desirable decreaser plants become less abundant. Increasers generally are less productive and less preferred by the grazing animal. Invaders are plants that are not part of the original plant community but invade because of some kind of disturbance or continued overgrazing. Some invader plants have little or no value for grazing.

Because plants do not respond in the same manner to different influences, a plant may be a decreaser on some range sites but an increaser on others. A cool-season plant, for example, may be a decreaser if the site is grazed only during the spring but would be an increaser if the same site were grazed only during the summer. The reverse would be true for the warm-season plants. Restricting grazing to the spring would cause the warm-season plants to increase in abundance, and restricting grazing to the summer would cause them to decrease.

Table 8 shows, for the soils in the county, the range site; the composition of species in the potential natural plant community; and the potential annual production of vegetation in favorable, average, and unfavorable years. *Potential annual production* is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year’s growth of leaf, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, average, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperature make growing conditions substantially better than average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Range management maintains the capacity of the rangeland to produce forage for livestock and game animals and to provide wildlife habitat, water, and watershed protection. The primary objective of good range management is to keep the rangeland in excellent or good condition. The main management concern is responding to important changes in the plant community of a range site.

Range condition is determined by comparing the present vegetation on a range site with the potential native plant community for the site. Four range condition classes are recognized. The range site is in *excellent* condition if 76 to 100 percent of the present

vegetation is the same kind as the potential native vegetation; in *good* condition if the percentage is 51 to 75; in *fair* condition if the percentage is 26 to 50; and in *poor* condition if the percentage is 25 or less. The potential production depends on the range site, the range condition, and the moisture available to plants during the growing season.

Measures that maintain or improve the range condition are needed on all of the rangeland in the county. They include proper stocking rates and rotation or deferred grazing systems. These systems provide rest periods that maintain or improve the vigor of the key plants. Good range management also includes range seeding, fencing, and measures that provide water for livestock.

The soils in the county are assigned to 14 different range sites. These range sites are described in the following paragraphs.

Clayey Overflow range site.—The potential native vegetation on this site is a mixture of tall and mid, warm-season prairie grasses. About 50 percent of the forage is a combination of big bluestem, indiangrass, and switchgrass, all of which are tall, warm-season grasses. Warm-season, mid grasses, such as little bluestem and sideoats grama, make up about 25 percent of the vegetation. Water-tolerant, tall, warm-season grasses, such as prairie cordgrass, make up about 15 percent of the vegetation in some areas. Forbs, such as stiff sunflower, heath aster, rush skeletonplant, and Missouri goldenrod, make up about 5 percent, and leadplant, wild rose, and sedges make up about 5 percent. Clamo soils are typical of soils on this site.

The major management concern on this site is maintaining the extent of the most productive grasses. Big bluestem, switchgrass, indiangrass, and stiff sunflower lose their productive capacity and thin out after continuous grazing because the livestock prefer these plants. As the extent of these plants decreases, the extent of little bluestem and sideoats grama initially increases. After continuous overgrazing, however, Kentucky bluegrass, a short, cool-season grass, becomes the principal plant on the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by proper stocking rates and by a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants. Limiting grazing in these areas when the soils are wet helps to prevent surface compaction.

Claypan range site.—The potential native vegetation is a prairie of mid and tall grasses interspersed with some forbs. Western wheatgrass and green needlegrass, which are cool-season grasses, are codominant species. They make up about 60 percent of the vegetation. Big bluestem and switchgrass, which are warm-season species, make up approximately 20 percent of the vegetation. Blue grama and sedges are common understory grasses that occur in small amounts. Forbs, such as sageworts, heath aster, and scarlet globemallow, make up about 5 percent of the vegetation. Cavour soils are typical of the soils on this site.

The major management concern on this site is maintaining the most productive plants. Big bluestem, switchgrass, and green needlegrass rapidly decrease in production after continued overgrazing because the livestock prefer these plants. As the extent of these plants decreases, the extent of western wheatgrass initially increases. After continuous overgrazing, however, western wheatgrass is replaced by short grasses, such as blue grama and bluegrasses. The most productive grasses can be maintained by proper stocking rates and by a deferred grazing or rotation grazing program, which provides periodic rest periods during the key growing seasons of the desirable plants. Limiting grazing in these areas when the soils are wet helps to prevent surface compaction.

Limy Subirrigated range site.—The potential native vegetation on this site is an excellent stand of warm-season, tall and mid grasses. Big bluestem and little bluestem, which are warm-season grasses, make up about 60 percent of the vegetation. The cool-season needlegrasses make up about 20 percent of the vegetation. Blue grama, bluegrasses, and sedges are in the understory. Forbs are common but not dominant. This site is less productive than the Subirrigated site because of the seasonal high water table and the high content of lime in the soils. Cubden, Divide, Hamerly, McIntosh, Moritz, and Wakonda soils are typical of the soils on this site.

The major management concern on this site is maintaining the extent of the most productive grasses. Big bluestem loses its productive capacity and thins out after continuous grazing because the livestock prefer this plant. As the extent of big bluestem decreases, the extent of little bluestem and sideoats grama initially increases. After continuous overgrazing, however, bluegrasses, sedges, and downy brome become the principal plants on the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by proper stocking rates and by a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Loamy Overflow range site.—The potential native vegetation on this site is tall, warm-season prairie grasses. Big bluestem makes up about 60 percent of

the production. Warm-season, mid grasses, such as little bluestem and sideoats grama, make up about 10 percent of the vegetation. Sedges and bluegrasses occur in the understory. Forbs, such as Maximilian sunflower, stiff sunflower, tall gayfeather, and goldenrod, and shrubs, such as leadplant and wildrose, occur on the site but are not dominant. Badger, Brookings, Chancellor, Davis, La Prairie, LaDelle, Svea, Trent, and Waubay soils are typical of the soils on this site.

The major management concern on this site is maintaining the extent of the most productive grasses and forbs. Big bluestem, switchgrass, Maximilian sunflower, and stiff sunflower lose their productive capacity and thin out after continuous grazing because the livestock prefer these plants. As the extent of these plants decreases, the extent of little bluestem and sideoats grama initially increases. After continuous overgrazing, however, bluegrass, a short, cool-season grass, becomes the principal plant on the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by proper stocking rates and by a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Saline Lowland range site.—The climax plant cover is made up of species that have a tolerance for salinity. Cordgrasses typically dominate the site and may make up as much as 55 percent of the vegetation. Saltgrass, Nuttall alkaligrass, switchgrass, western wheatgrass, alkali muhly, and foxtail barley make up about 35 percent of the vegetation. Sedges and forbs, such as seepweed and glasswort, make up about 10 percent of the vegetation. The soils typically have a water table within a depth of 1 to 4 feet. Included with this site are areas, too small to map separately, that do not have a water table high enough to support cordgrasses. In these included areas the percentage of cordgrass is lower and the percentages of other species are higher. The saline Ludden soil is typical of the soils on this site.

The major management concern on this site is maintaining the most productive grasses. Cordgrass and Nuttall alkaligrass rapidly lose vigor and density if continued overgrazing is allowed. As a result, saltgrass increases in extent and becomes the principal grass on the site. Because this species is characterized by lower productivity and low palatability in most seasons, forage production on the site is greatly reduced. The most productive grasses can be maintained by using proper stocking rates and a deferred grazing or rotation grazing program, which provides periodic rest periods during the key growing season of the desirable plants. If grazing is allowed on this site during periods when the soils are wet, surface compaction is a concern.

Sandy range site.—The potential native vegetation on this site is dominated by tall and mid, warm-season grasses. Big bluestem, sand bluestem, prairie sandreed, and switchgrass make up about 50 percent of the vegetation. Sideoats grama and little bluestem make up about 30 percent. Needleandthread, porcupinegrass, and Canada wildrye, which are cool-season grasses, make up about 10 percent. Forbs, such as heath aster, scurfpea, and perennial sunflowers, make up about 5 percent. Shrubs, such as wild rose and leadplant, occur on the site but are not dominant. Egeland, Embden, Lanona, Maddock, and Swenoda soils are typical of the soils on this site.

The major management concern on this site is maintaining the extent of the most productive grasses. The extent of sand bluestem, switchgrass, and porcupinegrass decreases after continuous grazing because the livestock prefer these plants. The extent of prairie sandreed, needleandthread, little bluestem, and sideoats grama initially increases as that of the other grasses decreases. After continuous overgrazing, these grasses thin out and are replaced by blue grama and Kentucky bluegrass. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by proper stocking rates and by a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the most desirable plants.

Shallow Marsh range site.—This site is ponded in spring and early summer. The potential native vegetation is water-tolerant, tall prairie grasses and sedges. Rivergrass and sedges make up about 75 percent of the vegetation. American mannagrass, cordgrasses, and reedgrass make up about 15 percent. Forbs, such as smartweed and waterplantain, make up about 10 percent. Parnell and Worthing soils are typical of the soils on this site.

The major management concern on this site is maintaining the extent of the most productive plants. After continued overgrazing, rivergrass and the palatable slough sedge are replaced by spikesedge and other grasslike plants that are less palatable to livestock. An increase in the abundance of the less palatable vegetation results in a loss of available forage. The extent of the most productive plants can be maintained by proper stocking rates and by a deferred grazing program, which provides rest periods during the key growing season of these plants.

Shallow to Gravel range site.—The potential native vegetation on this site is mid prairie grasses. Needleandthread, a cool-season grass, makes up

about 45 percent of the vegetation. Warm-season grasses make up about 35 percent. These include little bluestem, plains muhly, and prairie dropseed, which make up 25 percent, and blue grama and hairy grama, which make up 10 percent. Sedges, forbs, and shrubs make up about 15 percent. Allivar, Arvilla, Renshaw, and Renwash soils are typical of the soils on this site.

The major management concern on this site is maintaining the extent of the most productive grasses. Needleandthread, little bluestem, plains muhly, and prairie dropseed rapidly thin out after continuous overgrazing. When the extent of these grasses decreases, the extent of sedges and blue grama or hairy grama increases. If overgrazing continues, the productivity of the site is greatly reduced. The extent of the most productive grasses can be maintained by proper stocking rates and by a rotation grazing or deferred grazing program, which provides rest periods during the key growing season of these plants.

Silty range site.—The potential native vegetation on this site is tall and mid grasses and a large number of forbs. Cool-season grasses make up about 20 percent of the vegetation. These include green needlegrass and porcupinegrass. Warm-season grasses, such as little bluestem, big bluestem, and prairie dropseed, make up about 55 percent of the vegetation. Forbs, such as blacksamson, dotted gayfeather, stiff sunflower, heath aster, and prairie clover, and shrubs, such as leadplant, rose, and western snowberry, make up about 10 percent. Barnes, Clarno, Doland, Egan, Estelline, Kranzburg, Poinsett, Singsaas, Vienna, and Wentworth soils are typical of the soils on this site.

The major management concern on this site is maintaining the extent of the most productive grasses. After continuous grazing, the extent of big bluestem, prairie dropseed, porcupinegrass, and green needlegrass decreases because the livestock prefer these plants. Little bluestem and sideoats grama initially increase in abundance after continuous grazing. After continuous overgrazing, however, short grasses, such as blue grama, annual bromes, and bluegrasses, become the dominant plants. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by proper stocking rates and by a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Subirrigated range site.—The potential native vegetation on this site is dominantly tall, warm-season grasses. Big bluestem, the dominant warm-season grass, makes up about 50 percent of the vegetation. Prairie cordgrass, switchgrass, indiangrass, and little bluestem make up about 35 percent. Forbs, such as American licorice, Maximilian sunflower, downy gentian, Canada milkvetch, heath aster, and Missouri goldenrod, make up about 5 percent. Arlo, Chaska, Lamoure, Lamo, Lowe, Marysland, and Minnewaukan soils are typical of the soils on this site.

The major management concern on this site is maintaining the extent of the most productive tall grasses. After continuous grazing, the extent of big bluestem, indiangrass, switchgrass, and forbs, such as Maximilian sunflower, decreases because the livestock prefer these plants. Little bluestem, sideoats grama, and sedges initially increase in abundance after continuous grazing. After continuous overgrazing, however, short grasses, such as bluegrasses and downy brome, and sedges become the dominant plants. Low forage production is the result. The extent of the most productive tall grasses can be maintained by proper stocking rates and by a rotation grazing or deferred grazing program, which provides rest periods during the key growing season of these plants.

Thin Upland range site.—The potential native vegetation on this site is tall and mid grasses and a large number of forbs. Warm-season grasses make up 60 percent of the vegetation. These include little bluestem, which makes up 35 percent; prairie dropseed and big bluestem, which make up 20 percent; and sideoats grama, which makes up 5 percent. Cool-season grasses, such as green needlegrass, porcupinegrass, and needleandthread, make up about 20 percent. Forbs, such as pasqueflower, dotted gayfeather, and blacksamson, and woody plants, such as leadplant and rose, make up about 10 percent. Buse, Ethan, and Langhei soils are typical of the soils on this site.

The major management concern on this site is maintaining the extent of the most productive grasses. Prairie dropseed, big bluestem, and porcupinegrass lose their productive capacity and thin out after continuous grazing because the livestock prefer these plants. The extent of little bluestem, sideoats grama, and needleandthread initially increases as the other grasses thin out. After continuous overgrazing, short grasses, such as blue grama, dominate the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by proper stocking rates and by a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Very Shallow range site.—The potential native vegetation on this site is mid and short grasses. Needleandthread, plains muhly, and sideoats grama, the dominant mid grasses, make up about 65 percent of the vegetation. Short grasses, such as blue grama and hairy grama, and sedges make up about 30

percent. Forbs, such as dotted gayfeather, blacksamson, and sagewort, make up about 5 percent. Shrubs, such as leadplant and wild rose, occur in lesser amounts. Sioux soils are typical of the soils on this site.

The main management concern on this site is maintaining a good stand of grasses. After overgrazing, the site rapidly deteriorates to a stand of grama grasses, threadleaf sedge, and a few unpalatable forbs. If overgrazing continues, the stand of short grasses may thin out and much of the site is subject to erosion. A productive cover of grasses can be maintained by proper stocking rates and by a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Wet Meadow range site.—This range site has the potential to produce a luxuriant stand of sedges and mid or tall grasses. Sedges are the dominant species. They make up about 40 percent of the vegetation. Tall grass species, such as reedgrasses, prairie cordgrass, and reed canarygrass, make up about 40 percent of the vegetation. Mid grasses, such as western wheatgrass and bluegrasses, make up about 10 percent of the vegetation. Forbs, such as smartweed, aster, and milkweed, are common but generally make up only about 5 percent of the vegetation. Willows make up about 5 percent of the vegetation. Tonka soils are typical of soils on this site.

The major management concern on this site is maintaining the most productive grasses and sedges. Some areas are not usable by livestock during the spring and early summer because they are commonly ponded for about 4 to 8 weeks after periods of snowmelt or heavy rainfall. Surface compaction can be a problem if grazing is allowed during wet periods. If continued overgrazing is permitted, the extent of the tall grasses and the more palatable sedges decreases; the extent of the less palatable spikesedge and rushes increases; and weedy grasses, such as foxtail barley, invade. Low forage production is the result. The most productive grasses and sedges can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing program, which provides periodic rest periods during the key growing seasons of these plants. If grazing is allowed on this site during periods when the soils are wet, surface compaction is a concern.

Wetland range site.—This range site has the potential to produce a luxuriant stand of grasses that tolerate a high water table. Because areas of this site are often under water during the spring, their use is limited to summer and fall. Prairie cordgrass is the dominant species. It makes up about 60 percent of the vegetation. Reedgrasses, reed canarygrass, switchgrass, Canada wildrye, bluegrasses, and sedges also grow on this site. They make up about 40 percent of the vegetation. Forbs, such as asters, waterhemlock, and giant goldenrod, and shrubs, such as indigo amorpha and willows, occur in small amounts. Castlewood, Oldham, Ludden, and Rauville soils are typical of the soils on this site.

The major management concern is maintaining the most productive plants. If continued overgrazing is allowed, the stand of climax grasses loses vigor and density and sedges, rushes, bluegrasses, and saltgrass increase or invade. A less productive plant community is the result. The most productive grasses can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing system, which provides periodic rest periods during the key growing seasons of these plants. If grazing is allowed on this site during periods when the soils are wet, surface compaction is a concern.

Native Woodland, Windbreaks, and Environmental Plantings

Gregory F. Yapp, forester, Natural Resources Conservation Service, helped prepare this section.

Native trees and shrubs grow on about 2,574 acres in Brookings County (USDA, 1987). The soils that support trees and shrubs are not classified as woodland soils. They are grassland soils, which formed under a grassland influence. Before the area was settled, periodic fires prevented the widespread establishment of trees and shrubs. Since the county was settled, however, and fire-control measures have been used, trees and shrubs have been established in some areas. Isolated trees and shrubs grow in small clumps and larger groves. Bur oak, green ash, eastern cottonwood, common chokecherry, hackberry, American elm, American plum, smooth sumac, western snowberry, elder, basswood, false indigo, sandbar willow, and peachleaf willow are some of the more common species in the survey area. These native wooded areas are mainly on the Buse and Barnes soils in the draws and gulches associated with the major drainageways in the county. Some of the more water-tolerant species, such as green ash, willows, eastern cottonwood, American elm, and boxelder, grow on Lamoure, Ludden, Lowe, and Rauville soils on the flood plains along major creeks and along the margins of some closed depressions and other wetlands. Most of the wooded areas are

used for recreation or as wildlife habitat. Some areas are periodically grazed by livestock.

Windbreaks have been planted over the years to protect livestock, buildings, and yards from wind and snow. In addition, these plantings provide important winter cover for wildlife. Several rows of broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife. This type of windbreak may consist of one row or multiple rows of adapted tree and shrub species.

Environmental plantings help to beautify and screen houses and other buildings. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Complete weed control is essential for the establishment and maintenance of a good windbreak. Cultivation and applications of herbicides are effective methods of controlling weeds.

Grazing is extremely damaging to windbreaks because livestock compact the soil and remove the lower branches of the trees and shrubs. Removal of the lower branches reduces the effectiveness of the windbreaks.

Table 9 shows suitable trees and shrubs for planting as well as the expected 20-year height of the species on the various soil types in the county.

At the end of each map unit description under the heading “Detailed Soil Map Units” and in the section “Interpretive Groups,” the soils are assigned to windbreak suitability groups. A windbreak suitability group is a distinctive group of soils that supports trees and shrubs having similar growth and survival rates if weather conditions are normal and the windbreak is properly managed. The relationship between the soils and the growth of trees and shrubs was ascertained during this survey. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the growth of trees and shrubs. Soil reaction, salt content, and a seasonal high water table also are important. The windbreak suitability groups in this survey area are described in the following paragraphs.

Group 1. The soils in this group are well suited to woody plantings. They are on footslopes of outwash plains and till plains and are on high flood plains. These soils receive additional moisture from runoff and flooding. Some areas are subirrigated. All climatically suited trees and shrubs grow well.

This group consists mainly of loamy, silty, and clayey, somewhat poorly drained to well drained soils that are moderately deep to very deep. Available water capacity is moderate or high. The fine sandy loams and loamy fine sands are subject to severe wind erosion. Clayey soils are subject to surface compaction during wet periods. Typical soils in this group are Brookings, Embden, and Waubay soils.

Soils in subgroup 1K are calcareous. Typical soils are Divide, McIntosh, and Moritz soils.

Group 2. The soils in this group are well suited to woody plantings. They are in basins, on toeslopes of till plains, and on low flood plains. They receive additional moisture from runoff or have a high water table within the root zone. All climatically suited trees and shrubs grow well.

This group consists of deep and very deep, sandy, silty, loamy, and clayey, poorly drained and somewhat poorly drained soils. Available water capacity is high. The soils may be excessively wet or may be ponded in the spring or during overflow periods. During these periods the clayey soils are subject to surface compaction. The sandy loams and loamy fine sands are subject to severe wind erosion. Badger soils are typical of the soils in this group.

Soils in subgroup 2K are calcareous. Typical soils are Lamoure soils.

Group 3. The soils in this group are well suited to woody plantings. They are on summits and backslopes of till plains and outwash plains. Except for those that require abundant moisture, all climatically suited trees and shrubs grow well.

This group consists of deep and very deep, loamy and silty, well drained soils. Available water capacity is moderate or high. The susceptibility to water erosion ranges from slight in the nearly level areas to severe in the strongly sloping areas. The susceptibility to wind erosion ranges from slight to severe. Typical soils are Barnes, Brandt, Kranzburg, Poinsett, Singsaas, and Vienna soils.

Group 4. The soils in this group are fairly well suited to woody plantings. They are on summits of ice-walled lake plains. Most of the climatically suited trees and shrubs grow well; however, maximum growth is not possible because of the limited root development.

This group consists of moderately deep to very deep, clayey soils and clayey soils that have a loamy or silty surface layer. The soils are moderately well drained and well drained. Available water capacity is low or moderate in the more clayey soils and moderate or high in the silty and loamy soils. The clayey soils are

subject to surface compaction during wet periods. Soils having accumulations of salts in the lower part of the subsoil also are in this group. The clayey soils are subject to severe wind erosion. The moderately sloping and strongly sloping soils are subject to severe water erosion. Typical soils in this group are Hetland soils.

Group 5. The soils in this group are well suited to woody plantings. They are on footslopes of till plains and on summits and backslopes of outwash plains. All climatically suited trees and shrubs grow well, except those that require abundant moisture.

This group consists mainly of deep and very deep, loamy and sandy, well drained, moderately well drained, and somewhat excessively drained soils. Available water capacity generally is low or moderate. The soils are subject to severe or very severe wind erosion. Typical soils are Egeland, Maddock, and Swenoda soils.

Group 6G. The soils in this group are poorly suited to woody plantings. They are on high flood plains and on summits and backslopes of outwash plains. No trees and shrubs grow well on the soils in this group. Plantings can be established, but optimum survival and growth should not be expected. Field windbreaks are not effective because of the slow growth rate and the low height at maturity.

This group consists of silty and loamy, well drained and somewhat excessively drained soils that are shallow or moderately deep to sand and gravel. Available water capacity is low or moderate. The moderately sloping and strongly sloping areas are subject to severe erosion. Typical soils in this group are Allivar, Estelline, Fordtown, Fordville, and Renwash soils.

Group 7. The soils in this group are poorly suited to woody plantings. No trees or shrubs grow well. Coniferous trees and shrubs are better suited than deciduous trees and shrubs. Plantings can be established, but optimum survival and growth should not be expected. Field windbreaks are not effective because of the slow growth rate and the low height at maturity.

This group consists of moderately deep, deep, and very deep, sandy, somewhat excessively drained and excessively drained soils. Available water capacity is very low or low. The soils are subject to very severe wind erosion. None of the soils in Brookings County are in this group.

Group 8. The soils in this group are poorly suited to woody plantings. They are on summits and backslopes of till plains and moraines. No trees and shrubs grow well. Plantings can be established, but optimum survival and growth should not be expected. Field windbreaks are not effective because of the slow growth rate and the low height at maturity.

This group consists of moderately deep to very deep, loamy and silty, well drained soils that contain enough calcium carbonate at or near the surface to adversely affect the growth and survival of trees and shrubs. Available water capacity is moderate or high. The soils are subject to severe wind erosion and water erosion. Typical soils in this group are Buse soils.

Group 9. The soils in this group are poorly suited to woody plantings. They have a dense claypan subsoil and an excessive amount of salt (especially sodium) in the lower part of the subsoil. They are on the lower footslopes of till plains. No trees and shrubs grow well because of the adverse effects of the dense claypan subsoil and the salts. The soils are subject to surface compaction during wet periods.

This group consists of deep and very deep, silty and loamy, moderately well drained soils. Available water capacity is low or moderate.

Soils in subgroup 9L are loamy and do not have a seasonal high water table. Typical soils in this group are Cavour soils.

Group 10. The soils in this group generally are unsuited to woody plantings. They are shallow to bedrock, very shallow to gravel, very saline, very alkaline, stony, or very wet. Specialized plantings for wildlife, recreation, or beautification may be established in some areas. The most favorable sites should be selected, and only those trees and shrubs that have the best potential to survive and grow should be planted.

The soils in this group have a wide range in texture, depth, drainage, available water capacity, permeability, and slope characteristics. Susceptibility to water erosion and wind erosion ranges from slight to very severe. Clayey soils are subject to surface compaction. Typical soils in this group are Langhei, Ludden, Rauville, Sioux, and Southam soils and the moderately steep and steep phases of Barnes and Buse soils.

Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local offices of the Natural Resources Conservation Service, the South Dakota Cooperative Extension Service, or the South Dakota Agricultural Experiment Station at South Dakota State University or from a commercial nursery.

Recreation

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for

recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils subject to flooding or ponding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding or ponding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding or ponding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding or ponding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding or ponding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife Habitat

Mark Hogan, wildlife biologist, U.S. Fish and Wildlife Service, helped prepare this section.

Brookings County provides a variety of wildlife habitat types, including pastureland, cropland, wetlands, shelterbelts, and bottom land. Wetlands provide the majority of habitat for wildlife in the county.

Brookings County is at the southern portion of the prairie pothole region (Berry, 1989). About 21 percent of the county is covered with wetlands, including depressional areas (called prairie potholes) and slope and riverine wetlands. The variety of wetlands is important for nesting and migrating waterfowl and shorebirds. Cattail marshes also serve as important winter cover for resident species, such as whitetail deer and pheasant.

Prairie pothole wetlands exhibit a broad range in size and wetness. All are important to the life cycles of migrating ducks (Berry, 1989). Temporary potholes, typically small areas that are flooded only in spring, provide the isolation that breeding pairs of ducks require. Deeper potholes maintain water through the summer and become nurseries for hatched ducklings. Pintail, mallard, teal, and wood ducks are the most common ducks in the county.

In addition to waterfowl, several species of birds are residents of the county or migrate through the area. Some of the more common birds are songbirds, shorebirds, upland birds (such as pheasant and gray partridge), and several species of hawks and owls. Bald eagles and golden eagles also migrate through the area in spring and fall.

Brookings County is used primarily as cropland. Woody habitat is available along the Big Sioux River, along the major creeks, and in windbreaks and shelterbelts. These woodland corridors and scattered woody areas are not abundant, but they are very important because they provide cover and food for many wildlife species.

Because of its diverse topography, Brookings

County lends itself to a variety of wildlife. Small game species include cottontail rabbits, jack rabbits, red squirrel, gray squirrel, and fox squirrel. Some of the more common furbearers include mink, weasel, muskrat, beaver, raccoon, skunk, badger, red fox, and coyote. Big game species include whitetail deer and mule deer.

Several lakes scattered throughout the western one-third of the county provide a habitat for a variety of game fish. The south end of Lake Poinsett is in the northwestern part of the county. The lake is stocked with walleye, northern pike, perch, channel catfish, tiger muskie, and black crappie. Other lakes used for fishing include Lake Hendricks, Lake Sinai, Oakwood Lake, Lake Tetonkaha, Oak Lake, and Lake Goldsmith.

Soils affect the kind and amount of vegetation and water that are available to wildlife for food and cover; therefore, they also affect the distribution and abundance of wildlife. Wildlife abundance depends on the amount and distribution of food, cover, and water. An understanding of soil capabilities is important in the development of wildlife habitat through planting desirable vegetation, maintaining existing vegetation, and promoting natural establishment of desirable plants.

Because of the topographic units they represent and the capabilities of the soils to produce and maintain vegetation, soil associations provide an indication of actual and potential distribution and density of wildlife and their habitat. Land use and management practices have a primary influence on wildlife. These practices also are influenced by the soils and often correlate with soil associations. The soil associations in Brookings County are described under the heading “General Soil Map Units.”

Individual soils have different potentials for the development and maintenance of wildlife habitat elements. The soils, therefore, influence the degree or extent to which wildlife habitat can be established or improved. The soils of Brookings County are rated in table 11 according to their potential to provide each of the wildlife habitat elements. This information can be used in planning parks, wildlife areas, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat. The ratings, described in the following paragraphs, indicate the ease of establishing or maintaining these elements.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. They are used mainly as food sources, although small grain crops also provide some nesting cover. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, salinity, slope, surface stoniness, ponding, and flooding. Soil temperature and soil moisture also are considerations. Examples of grain and seed crops important to wildlife in Brookings County are corn, wheat, and oats.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. They are used as nesting and roosting cover. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, salinity, surface stoniness, ponding, flooding, and slope. Soil temperature and soil moisture also are considerations. Examples of grasses and legumes are intermediate wheatgrass, bromegrass, and alfalfa.

Native herbaceous plants are native or naturally established grasses and forbs, including weeds. They are used for food, nesting, and escape cover. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, salinity, surface stoniness, ponding, and flooding. Soil temperature and soil moisture also are considerations. Examples of wild herbaceous plants are big bluestem, switchgrass, indiangrass, lead plant, yellow coneflower, and wild licorice.

Planted woody plants include trees and shrubs that require cultivation before and during establishment and eventually will provide fruit, buds, twigs, bark, and foliage. These plants are important as food sources and provide reproductive cover, winter cover, and escape cover. Soil properties that affect the growth of

trees and shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of these trees and shrubs are green ash, hackberry, caragana, plum, chokecherry, Rocky Mountain juniper, and eastern redcedar.

Native deciduous trees and woody understory produce nuts or other fruit, buds, twigs, bark, and foliage. Besides the food sources they provide, these elements are important for winter cover and escape cover. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are elm, cottonwood, ash, bur oak, willow, plum, and chokecherry.

Native coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Eastern redcedar is the only species of this type that grows regularly in the survey area.

Native shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are gooseberry, currants, snowberry, and sumac.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. They are important as food and provide reproductive and winter cover. Soil properties and features affecting wetland plants are texture of the surface layer, wetness (flooding, ponding, or high water table), reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, cattails, sloughgrass, white top, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet and include naturally wet areas. Shallow water areas can be created by dams, levees, or other water-control structures. Soil properties and features affecting the development of shallow water areas are depth to bedrock, wetness (flooding or ponding), surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

Information concerning the habitat elements needed to maintain and manage specific wildlife species can be obtained from the local office of the Natural Resources Conservation Service; the South Dakota Department of Game, Fish and Parks; the United States Fish and Wildlife Service; or the Wildlife and Fisheries Sciences Department at South Dakota State University.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the data in the tables described under the heading “Soil Properties.”

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 60 or 80 inches. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate

potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, or other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock or a very firm dense layer, stone content, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 60 to 80 inches are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

The table also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is

evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock, and flooding or ponding affect absorption of the effluent. Large stones and bedrock interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

The table gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, ponding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in the table are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, flooding, and ponding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, rock fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 60 or 80 inches.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 60 or 80 inches. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones or have a water table at a depth of 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent; are wet; or have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Reaction and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, salinity, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, flooding, ponding, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, have a seasonal high water table at or near the surface, or are subject to frequent flooding or ponding.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and absorption of nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to

overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by the cropping system, depth to the water table, flooding, ponding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examination, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

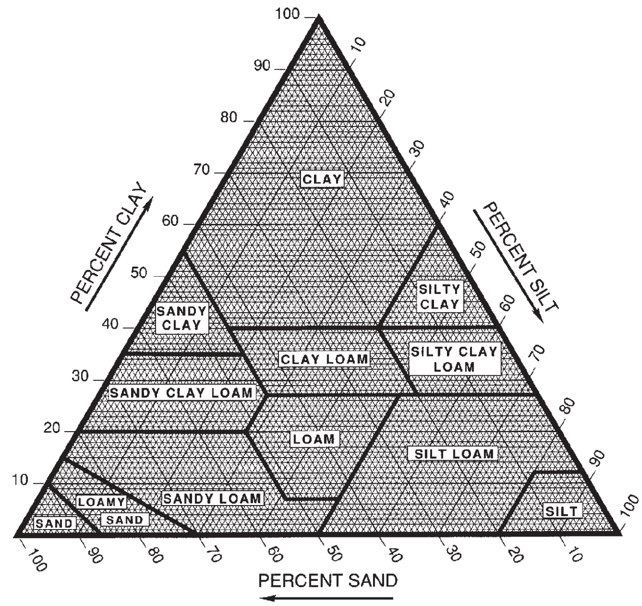

Figure 14.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 16 gives the engineering classifications and the range of index properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 14). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2001) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2000).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and

plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of particle-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is generally omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In the table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^{1}/_{3}$-bar moisture tension. Weight is determined after the soil is dried at 105 degrees C. In table 17, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design and management of irrigation systems, the development of nutrient and pesticide management plans, and the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect retention of water and depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown, in the selection of a tillage system, in crop residue management decisions, and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in selecting pesticides, in evaluating

soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on the basis of measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, 6 to 9 percent; and *very high*, greater than 9 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.64. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without reducing soil quality or crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.

8. Soils that are not subject to wind erosion because of rock fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist

mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in the table, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

The table gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in the table are depth to the seasonal high water table, the kind of water table, and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in the table.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. “More than 6.0” indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Endoaquolls (*Endo*, referring to endosaturation, plus *aquolls*, the suborder of the Mollisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. An example is Cumulic Endoaquolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle size, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed (calcareous), frigid Cumulic Endoaquolls.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” (Soil Survey Division Staff, 1993). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (Soil Survey Staff, 1999) and in “Keys to Soil Taxonomy” (USDA, 1996). Unless otherwise indicated, matrix colors in the descriptions are for dry soil. Redoximorphic concentrations, redoximorphic depletions, mottles (which are color patterns not related to soil wetness), organic coats, and manganese stains are described under moist conditions. Following the pedon description is the range of important characteristics of the soils in the series.

The following series were sampled to a depth of 80 inches: Allivar, Arlo, Brookings, Buse, Castlewood, Cavour, Darnen, Egan, Egeland, Embden, Ethan, Fordtown, Goldsmith, Hamerly, Kranzburg, La Prairie, LaDelle, Langhei, Lanona, Lowe, Maddock, Marysland, McIntosh, Moritz, Oldham, Poinsett,

Renwash, Singsaas, Southam, Spottswood, Svea, Venagro, and Vienna. All other typical pedons were sampled to a depth of 60 inches.

Allivar Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately rapid in the loamy sediments and very rapid in the underlying sandy material
Landform: Flood plains
Parent material: Loamy alluvium over outwash
Slope: 0 to 2 percent

Typical Pedon

Allivar sandy loam, 0 to 2 percent slopes, 2,470 feet north and 1,660 feet east of the southwest corner of sec. 24, T. 111 N., R. 51 W.; USGS Bruce, South Dakota, topographic quadrangle; lat. 44 degrees 24 minutes 20 seconds N. and long. 96 degrees 54 minutes 1 second W.

Ap—0 to 6 inches; very dark gray (10YR 3/1) sandy loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure parting to moderate fine and medium granular; slightly hard, friable; common very fine roots throughout; common fine pores; neutral; abrupt smooth boundary.

Bw—6 to 15 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, friable; common very fine roots throughout; common fine pores; common distinct patchy black (10YR 2/1) organic coats throughout; 2 percent gravel; slightly alkaline; gradual smooth boundary.

2C1—15 to 40 inches; light brownish gray (10YR 6/2) sand, dark grayish brown (10YR 4/2) moist; single grain: loose; many carbonate coats on sand and gravel; 10 percent gravel; strongly effervescent; moderately alkaline; gradual smooth boundary.

2C2—40 to 50 inches; light brownish gray (2.5Y 6/2) sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; few prominent patchy black (7.5YR 2/1) manganese or iron-manganese stains throughout and few prominent patchy dark reddish brown (5YR 3/4) manganese or iron-manganese stains throughout; common fine and medium distinct yellowish brown (10YR 5/6) redoximorphic concentrations; 2 percent gravel; strongly effervescent; strongly alkaline; clear smooth boundary.

2C3—50 to 80 inches; pale brown (10YR 6/3) very gravelly sand, brown (10YR 4/3) moist; single grain; loose; many carbonate coats on undersides of sand and gravel; 45 percent gravel; strongly effervescent; strongly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 14 to 25 inches
Depth to contrasting parent material: 14 to 25 inches to gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—sandy loam; coarse sandy loam, loam, or fine sandy loam in some pedons

Bw horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 or 5 (2 to 5 moist)
Chroma—1 to 4
Texture—sandy loam; loam, fine sandy loam, loamy sand, or coarse sandy loam in some pedons

2C horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 to 7 (3 to 6 moist)
Chroma—2 to 6
Texture—sand or very gravelly sand; coarse sand, gravelly sand, gravelly coarse sand, or very gravelly coarse sand in some pedons

Arlo Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Flood plains
Parent material: Loamy alluvium over outwash
Slope: 0 to 1 percent

Typical Pedon

Arlo loam, 0 to 1 percent slopes, 2,400 feet east and 100 feet north of the southwest corner of sec. 31, T. 109 N., R. 49 W.; USGS Medary, South Dakota, topographic quadrangle; lat. 44 degrees 11 minutes 15 seconds N. and long. 96 degrees 45 minutes 26 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate fine granular; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; 5 percent calcium carbonate; 1 percent gravel; strongly effervescent; slightly alkaline; abrupt smooth boundary.

Ak—8 to 15 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine pores; many fine soft masses of carbonate; 18 percent calcium carbonate; 1 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.

Bkg1—15 to 23 inches; 50 percent gray (2.5Y 5/1) and 50 percent grayish brown (2.5Y 5/2) loam, 50 percent very dark gray (2.5Y 3/1) moist and 50 percent dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine pores; many fine soft masses of carbonate; 22 percent calcium carbonate; 1 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.

Bkg2—23 to 31 inches; 50 percent gray (2.5Y 5/1) and 50 percent light brownish gray (2.5Y 6/2) loam, 50 percent dark gray (2.5Y 4/1) moist and 50 percent grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine pores; many fine soft masses of carbonate; 25 percent calcium carbonate; 1 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.

BCg—31 to 36 inches; 70 percent light brownish gray (2.5Y 6/2) and 30 percent gray (2.5Y 6/1) loam, 70 percent dark grayish brown (2.5Y 4/2) moist and 30 percent gray (2.5Y 5/1) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; many very fine pores; many fine and medium soft masses of carbonate; 14 percent calcium carbonate; many fine prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; 2 percent gravel; strongly effervescent; slightly alkaline; clear smooth boundary.

2Cg1—36 to 55 inches; light brownish gray (2.5Y 6/2) very gravelly loamy sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; few discontinuous carbonate coats on sand and gravel; 7 percent calcium carbonate; many fine prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; 50 percent gravel; strongly effervescent; slightly alkaline; abrupt smooth boundary.

2Cg2—55 to 64 inches; light brownish gray (2.5Y 6/2) loamy sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; 1 percent calcium carbonate; many fine prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; very slightly effervescent; slightly alkaline; abrupt smooth boundary.

2Cg3—64 to 80 inches; light brownish gray (2.5Y 6/2) extremely gravelly loamy sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; few discontinuous carbonate coats on sand and gravel; many fine prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; 5 percent calcium carbonate; 70 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 30 inches
Depth to carbonates: 0 to 16 inches
Depth to contrasting parent material: 20 to 40 inches to gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons do not have the 2Cg3 horizon of extremely gravelly loamy sand and do not contain 70 percent gravel.

A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 to 5 (2 to 3 moist)
Chroma—0 to 2
Texture—loam; clay loam, silt loam, or silty clay loam in some pedons

Bkg horizon:
Hue—10YR, 2.5Y. 5Y, or N
Value—5 to 8 (3 to 6 moist)
Chroma—0 to 2
Texture—loam; clay loam, sandy clay loam, sandy loam, or gravelly clay loam in some pedons

2Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (3 to 6 moist)
Chroma—1 to 4
Texture—very gravelly loamy sand, loamy sand, or

extremely gravelly loamy sand; sand, gravelly sand, gravelly loamy sand, or very gravelly sand in some pedons

Arvilla Series

Depth to bedrock: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid in the loamy sediments and very rapid in the underlying sandy material
Landform: Outwash plains
Parent material: Loamy alluvium over outwash
Slope: 2 to 6 percent

Typical Pedon

Arvilla sandy loam, 2 to 6 percent slopes, 2,440 feet south and 63 feet east of the northwest corner of sec. 21, T. 115 N., R. 48 W., in Deuel County, South Dakota; USGS Lake Francis, South Dakota, topographic quadrangle; lat. 44 degrees 45 minutes 17 seconds N. and long. 96 degrees 36 minutes 5 seconds W.

A—0 to 8 inches; dark gray (10YR 4/1) sandy loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, very friable; common very fine and fine roots; few very fine pores; neutral; clear smooth boundary.

Bw1—8 to 11 inches; dark grayish brown (10YR 4/2) coarse sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; few very fine and fine roots; few very fine pores; neutral; clear smooth boundary.

Bw2—11 to 19 inches; brown (10YR 5/3) coarse sandy loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; few very fine roots; few very fine pores; neutral; abrupt wavy boundary.

2Bk—19 to 32 inches; pale brown (10YR 6/3) gravelly coarse sand, brown (10YR 4/3) moist; single grain; loose; few discontinuous carbonate coats on sand and gravel; 20 percent gravel; strongly effervescent; slightly alkaline; gradual wavy boundary.

2C—32 to 60 inches; pale brown (10YR 6/3) gravelly coarse sand, brown (10YR 4/3) moist; single grain; loose; few discontinuous carbonate coats on sand and gravel; 25 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 13 to 25 inches
Depth to contrasting parent material: 14 to 25 inches to gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—sandy loam; coarse sandy loam, loam, or fine sandy loam in some pedons

Bw horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—3 to 5 (2 to 5 moist)
Chroma—1 to 4
Texture—sandy loam or coarse sandy loam; loam, fine sandy loam, or loamy sand in some pedons

2Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (3 to 5 moist)
Chroma—1 to 4
Texture—gravelly coarse sand; sand, coarse sand, gravelly sand, or very gravelly coarse sand in some pedons

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—gravelly coarse sand; sand, coarse sand, loamy sand, or loamy coarse sand in some pedons

Badger Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium over silty glacial till or loamy glacial till
Slope: 0 to 1 percent

Typical Pedon

Badger silty clay loam, 0 to 1 percent slopes, 1,225 feet east and 180 feet south of the northwest corner of sec. 25, T. 110 N., R. 52 W.; USGS Lake Sinai, South Dakota, topographic quadrangle; lat. 44 degrees 18 minutes 39 seconds N. and long. 97 degrees 1 minute 24 seconds W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine granular

structure; hard, friable, slightly sticky and slightly plastic; common fine roots; few very fine pores; neutral; abrupt smooth boundary.

A—7 to 17 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few fine pores; neutral; clear wavy boundary.

Bt1—17 to 34 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine and fine pores; common continuous clay films on faces of peds and in pores; neutral; gradual wavy boundary.

Bt2—34 to 42 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, slightly sticky and slightly plastic; common very fine and fine roots; few very fine and fine pores; common continuous clay films on faces of peds and in pores; neutral; clear wavy boundary.

Bkg—42 to 58 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; very hard, friable, slightly sticky and slightly plastic; few fine roots; few very fine pores; common fine soft masses of carbonate; common fine prominent strong brown (7.5YR 5/8) redoximorphic concentrations and common fine prominent light gray (2.5Y 7/2) redoximorphic depletions; strongly effervescent; slightly alkaline; clear wavy boundary.

Cg—58 to 60 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, slightly sticky and slightly plastic; few fine roots; few very fine pores; few fine soft masses of carbonate and common fine iron-manganese concretions; common fine prominent strong brown (7.5YR 5/8) redoximorphic concentrations and common fine prominent light gray (2.5Y 7/1) redoximorphic depletions; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 45 inches
Depth to carbonates: More than 35 inches
Depth to contrasting parent material: More than 40 inches to glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 45 inches
Other features: Some pedons have a 2C horizon.

A horizon:
Hue—10YR, 2.5Y, or N
Value—3 or 4 (2 to 3 moist)
Chroma—0 to 1
Texture—silty clay loam; silt loam, clay loam, or loam in some pedons

Bt horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 6 (2 to 5 moist)
Chroma—1 or 2
Texture—silty clay or silty clay loam; clay or clay loam in some pedons

Bkg horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—silt loam; loam, clay loam, silty clay, or silty clay loam in some pedons

Cg horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 6
Texture—silt loam or silty clay loam

Barnes Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains and moraines
Parent material: Loamy glacial till
Slope: 0 to 25 percent

Typical Pedon

Barnes loam (fig. 15), in an area of Buse-Barnes loams, 9 to 20 percent slopes, 1,270 feet east and 960 feet south of the northwest corner of sec. 20, T. 110 N., R. 52 W.; USGS Lake Sinai, South Dakota, topographic quadrangle; lat. 44 degrees 19 minutes 22 seconds N. and long. 97 degrees 6 minutes 16 seconds W.

A—0 to 7 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; few very fine pores; 2 percent gravel; neutral; clear wavy boundary.

Bw1—7 to 12 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak

medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few fine pores; 2 percent gravel; neutral; clear wavy boundary.

Bw2—12 to 18 inches; brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine and fine pores; 2 percent gravel; neutral; clear wavy boundary.

Bk1—18 to 27 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; few fine prominent brown (7.5YR 4/4) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine pores; many fine and medium soft masses of carbonate; 3 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—27 to 42 inches; light olive brown (2.5Y 5/3) clay loam, olive brown (2.5Y 4/3) moist; common fine prominent red (2.5YR 4/8) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; few very fine pores; many fine and medium soft masses of carbonate; 3 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—42 to 60 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; few fine prominent red (2.5YR 4/8) mottles; massive; hard, firm, slightly sticky and slightly plastic; few very fine pores; common fine soft masses of carbonate; 3 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 10 to 20 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam or clay loam; fine sandy loam, sandy loam, sandy clay loam, or silt loam in some pedons

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 6 (2 to 5 moist)
Chroma—2 to 4
Texture—loam; clay loam or sandy clay loam in some pedons

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 8 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

Brandt Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Landform: Outwash plains
Parent material: Silty glaciofluvial deposits over outwash
Slope: 0 to 6 percent

Typical Pedon

Brandt silty clay loam, 0 to 2 percent slopes, 935 feet west and 460 feet north of the southeast corner of sec. 3, T. 111 N., R. 51 W.; USGS Bruce, South Dakota, topographic quadrangle; lat. 44 degrees 26 minutes 36 seconds N. and long. 96 degrees 55 minutes 48 seconds W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak medium granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few fine pores; neutral; abrupt smooth boundary.

Bw1—9 to 14 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine pores; neutral; clear smooth boundary.

Bw2—14 to 26 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; moderate medium

prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; neutral; clear smooth boundary.

Bw3—26 to 35 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; slightly alkaline; clear smooth boundary.

Bk—35 to 48 inches; light olive brown (2.5Y 5/4) silty clay loam, olive brown (2.5Y 4/4) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine pores; few medium soft masses of carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C—48 to 60 inches; light olive brown (2.5Y 5/4) gravelly sand, olive brown (2.5Y 4/4) moist; single grain; loose; few discontinuous carbonate coats on sand and gravel; 30 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 16 inches
Depth to carbonates: 20 to 48 inches
Depth to contrasting parent material: 40 to 60 inches to gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (2 to 5 moist)
Chroma—2 to 4
Texture—silty clay loam or silt loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 to 4
Texture—silty clay loam, silt loam, or loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—gravelly sand; loamy sand, sand, gravelly loam, gravelly loamy sand, very gravelly loamy sand, or very gravelly sand in some pedons

Brookings Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Loess over loamy glacial till
Slope: 0 to 2 percent

Typical Pedon

Brookings silty clay loam (fig. 16), in an area of Kranzburg-Brookings silty clay loams, 0 to 2 percent slopes, 1,200 feet north and 170 feet west of the southeast corner of sec. 17, T. 111 N., R. 49 W.; USGS White, South Dakota, topographic quadrangle; lat. 44 degrees 24 minutes 57 seconds N. and long. 96 degrees 43 minutes 39 seconds W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium prismatic structure parting to moderate fine and medium angular blocky; very hard, very firm, sticky and very plastic; common very fine and fine roots throughout; common very fine pores; neutral; abrupt smooth boundary.

Bw1—9 to 16 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, firm, sticky and very plastic; common very fine roots throughout; common very fine pores; common fine light olive brown (2.5Y 5/3) wormcasts throughout; neutral; clear wavy boundary.

Bw2—16 to 24 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; common very fine roots throughout; many very fine pores; common fine light olive brown (2.5Y 5/3) wormcasts throughout; neutral; clear wavy boundary.

Bw3—24 to 30 inches; 90 percent light olive brown (2.5Y 5/3) and 10 percent olive brown (2.5Y 4/3) silty clay loam, 90 percent olive brown (2.5Y 4/3) moist and 10 percent very dark grayish brown (2.5Y 3/2) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots throughout;

many very fine and fine pores; common fine very dark grayish brown (10YR 3/2) wormcasts throughout; common fine prominent yellowish brown (10YR 5/4) redoximorphic concentrations and few fine prominent dark gray (2.5Y 4/1) redoximorphic depletions; neutral; clear wavy boundary.

2BC—30 to 37 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; common very fine roots throughout; common very fine and fine pores; common fine rounded black (2.5Y 2/1) iron-manganese concretions; light olive brown (2.5Y 5/6) redoximorphic concentrations and common fine distinct gray (2.5Y 5/1) redoximorphic depletions; 1 percent gravel; very slightly effervescent; slightly alkaline; clear wavy boundary.

2C—37 to 80 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; very hard, very firm, sticky and very plastic; few prominent black (2.5Y 2/1) manganese or iron-manganese stains; common fine and medium rounded carbonate concretions; yellowish brown (10YR 5/8) redoximorphic concentrations; common medium and coarse distinct gray (2.5Y 6/1) and few medium prominent gray (N 5/0) redoximorphic depletions; 2 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 25 inches
Depth to carbonates: 20 to 36 inches
Depth to contrasting parent material: 20 to 40 inches to loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a Bk horizon, and some have a C horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 4
Texture—silty clay loam or silt loam

2C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

Buse Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains and moraines
Parent material: Loamy glacial till
Slope: 3 to 40 percent

Typical Pedon

Buse loam (fig. 17), in an area of Buse-Langhei complex, 15 to 40 percent slopes, 400 feet west and 200 feet south of the northeast corner of sec. 22, T. 112 N., R. 48 W.; USGS White NE, South Dakota, topographic quadrangle; lat. 44 degrees 29 minutes 56 seconds N. and long. 96 degrees 34 minutes 2 seconds W.

A—0 to 7 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; few fine pores; 8 percent calcium carbonate; 5 percent gravel; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk1—7 to 17 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; few fine prominent strong brown (7.5YR 4/6) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine and fine pores; few fine and medium rounded soft masses of carbonate and common medium and coarse cylindrical wormcasts; 30 percent calcium carbonate; violently effervescent; 5 percent gravel; slightly alkaline; gradual wavy boundary.

Bk2—17 to 32 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; few fine prominent strong brown (7.5YR 4/6) and common fine and medium prominent brownish yellow (10YR 6/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine pores; common fine and medium rounded

soft masses of carbonate and common medium and coarse cylindrical wormcasts; 30 percent calcium carbonate; 5 percent gravel; violently effervescent; slightly alkaline; gradual wavy boundary.

C—32 to 80 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; common fine and medium prominent yellowish brown (10YR 5/6) and few fine prominent strong brown (7.5YR 4/6) mottles; massive; hard, firm, slightly sticky and slightly plastic; few fine pores; common fine and medium rounded soft masses of carbonate; 14 percent calcium carbonate; 5 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 10 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—loam or clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 8 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 7 (4 to 6 moist)
Chroma—2 to 6
Texture—clay loam or loam

Castlewood Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landform: Flood plains
Parent material: Clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Castlewood silty clay, 0 to 1 percent slopes, 2,490 feet south and 2,200 feet east of the northwest corner of sec. 5, T. 109 N., R. 49 W.; USGS Aurora, South Dakota, topographic quadrangle; lat. 44 degrees 16 minutes 32 seconds N. and long. 96 degrees 44 minutes 22 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; weak medium angular blocky structure parting to strong medium granular; hard, firm, sticky and very plastic; common fine and many very fine roots; neutral; abrupt smooth boundary.

A—8 to 12 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; moderate medium angular blocky structure parting to strong medium granular; very hard, firm, sticky and very plastic; common very fine roots; neutral; clear smooth boundary.

Bg1—12 to 30 inches; very dark gray (2.5Y 3/1) clay, black (2.5Y 2/1) moist; weak medium prismatic structure parting to moderate fine and medium angular blocky; very hard, firm, sticky and very plastic; common very fine roots; neutral; clear smooth boundary.

Bg2—30 to 46 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; hard, firm, sticky and very plastic; common very fine roots; common fine soft masses of carbonate; few fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations; strongly effervescent; moderately alkaline; clear wavy boundary.

Cg1—46 to 60 inches; light gray (5Y 7/2) silty clay loam, olive gray (5Y 5/2) moist; massive; very hard, firm, sticky and plastic; common very fine roots; common very fine pores; common fine very dark brown (10YR 2/2) iron-manganese concretions; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; common fine distinct greenish gray (5BG 6/1) and common fine faint gray (5Y 6/1) redoximorphic depletions; 1 percent gravel; strongly effervescent; slightly alkaline; gradual wavy boundary.

Cg2—60 to 80 inches; light gray (5Y 7/2) clay loam, olive gray (5Y 5/2) moist; massive; very hard, firm, sticky and plastic; common fine very dark brown (10YR 2/2) iron-manganese concretions; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations and common fine faint gray (5Y 6/1) redoximorphic depletions; 2 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: More than 24 inches
Depth to carbonates: More than 15 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a Bkg horizon.

A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay; clay, clay loam, or silty clay loam in some pedons

Bg horizon:
Hue—2.5Y, 5Y, or N
Value—3 to 6 (2 to 5 moist)
Chroma—1 or 2
Texture—clay; silty clay, silty clay loam, or clay loam in some pedons

Cg horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 3
Texture—clay loam; silty clay loam, silty clay, or clay in some pedons

Cavour Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Very slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Cavour clay loam, in an area of Hamerly-Cavour-Badger complex, 0 to 2 percent slopes, 640 feet north and 200 feet east of the southwest corner of sec. 29, T. 112 N., R. 49 W.; USGS White, South Dakota, topographic quadrangle; lat. 44 degrees 28 minutes 21 seconds N. and long. 96 degrees 44 minutes 45 seconds W.

Ap—0 to 7 inches; dark gray (10YR 4/1) clay loam, black (10YR 2/1) moist; moderate fine and medium granular structure; hard, firm, slightly sticky and slightly plastic; common fine roots; few very fine pores; few faint discontinuous gray (10YR 5/1) and very dark gray (10YR 3/1) coats on faces of peds and in pores; slightly alkaline; abrupt smooth boundary.

Btn1—7 to 13 inches; dark gray (10YR 4/1) clay loam, black (10YR 2/1) moist; moderate medium and coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, firm, sticky and plastic; common fine roots; few very fine pores; few discontinuous clay films; moderately alkaline; clear smooth boundary.

Btn2—13 to 22 inches; light olive brown (2.5Y 5/3) clay loam, olive brown (2.5Y 4/3) moist; moderate medium and coarse prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, sticky and plastic; few fine roots; few very fine pores; few prominent discontinuous black (10YR 2/1) coats on faces of peds and in pores; moderately alkaline; abrupt wavy boundary.

Bk—22 to 30 inches; light olive brown (2.5Y 5/3) clay loam, olive brown (2.5Y 4/3) moist; weak medium and coarse prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; few prominent discontinuous black (10YR 2/1) coats in root channels and pores; common fine rounded salt masses; strongly effervescent; strongly alkaline; gradual wavy boundary.

BC—30 to 44 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; moderate coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine pores; few fine and medium prominent strong brown (7.5YR 5/8) redoximorphic concentrations; strongly effervescent; strongly alkaline; gradual wavy boundary.

C1—44 to 59 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, firm, sticky and plastic; few fine gypsum accumulations; common fine and medium prominent strong brown (7.5YR 5/8) redoximorphic concentrations; 1 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—59 to 80 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, firm, sticky and plastic; few fine gypsum accumulations; common fine and medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations; 1 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 35 inches
Depth to carbonates: 14 to 35 inches

Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): 16 to 45 inches

A horizon:
Hue—10YR or N
Value—3 to 5 (2 or 3 moist)
Chroma—0 or 1
Texture—clay loam; silt loam or loam in some pedons

Btn horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 3
Texture—clay loam; clay, silty clay, or silty clay loam in some pedons

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 (4 or 5 moist)
Chroma—1 to 3
Texture—clay loam; loam, silty clay loam, silty clay, or clay in some pedons

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 or 5 moist)
Chroma—1 to 4
Texture—clay loam or loam

Chancellor Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Silty glacial till
Slope: 0 to 1 percent

Typical Pedon

Chancellor silty clay loam, in an area of Wentworth-Chancellor-Wakonda silty clay loams, 0 to 2 percent slopes, 2,457 feet south and 203 feet west of the northeast corner of sec. 14, T. 108 N., R. 50 W., in Moody County, South Dakota; USGS Medary, South Dakota, topographic quadrangle; lat. 44 degrees 9 minutes 36 seconds N. and long. 96 degrees 47 minutes 21 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; hard, friable, slightly sticky and slightly plastic; common fine roots; few very fine pores; neutral; abrupt smooth boundary.

A—8 to 12 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak medium granular; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few fine pores; neutral; clear wavy boundary.

Btg1—12 to 28 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; common very fine and fine roots; few very fine pores; shiny faces on vertical peds; slightly alkaline; gradual wavy boundary.

Btg2—28 to 38 inches; light olive gray (5Y 6/2) silty clay, olive gray (5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; common very fine and fine roots; few very fine and fine pores; faint very dark gray (5Y 3/1) clay films on faces of peds and pressure faces on faces of peds; few fine iron-manganese concretions; few fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations and black (N 2/0) redoximorphic depletions; slightly alkaline; gradual wavy boundary.

Bkg—38 to 43 inches; pale olive (5Y 6/3) silty clay loam, olive (5Y 5/3) moist; weak medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; few fine roots; few very fine pores; few fine iron-manganese concretions and common fine and medium soft masses of carbonate; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations and black (N 2/0) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cg—43 to 60 inches; light gray (5Y 7/2) silty clay loam, light olive gray (5Y 6/2) moist; massive; very hard, friable, slightly sticky and slightly plastic; common fine iron-manganese concretions; many fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations and common fine prominent black (10YR 2/1) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 40 inches
Depth to carbonates: 28 to 50 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR, 2.5Y, or N
Value—3 or 4 (2 to 3 moist)
Chroma—0 or 1
Texture—silty clay loam or silty clay

Btg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 6 (2 to 4 moist)
Chroma—1 or 2
Texture—silty clay or silty clay loam

Bkg horizon:
Hue—2.5Y or 5Y
Value—4 to 7 (3 to 6 moist)
Chroma—1 to 4
Texture—silty clay loam

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—silty clay loam; clay loam or loam in some pedons

Chaska Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 2 percent

Typical Pedon

Chaska loam, channeled, 1,150 feet south and 90 feet east of the northwest corner of sec. 15, T. 107 N., R. 48 W., in Moody County, South Dakota; USGS Flandreau, South Dakota, topographic quadrangle; lat. 44 degrees 4 minutes 38 seconds N. and long. 96 degrees 35 minutes 10 seconds W.

A—0 to 7 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, friable; common very fine and fine roots; common very fine pores; strongly effervescent; slightly alkaline; clear smooth boundary.

C—7 to 14 inches; dark gray (10YR 4/1), stratified loam and fine sandy loam, very dark gray (10YR 3/1) moist; massive; slightly hard, friable; common very fine and fine roots; common very fine and fine pores; few fine fragments of snail shells; strongly effervescent; slightly alkaline; clear smooth boundary.

Cg1—14 to 30 inches; dark gray (5Y 4/1), stratified loam and fine sandy loam, very dark gray (5Y 3/1) moist; massive; soft, very friable; common very fine and fine roots; few very fine pores; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; common fine fragments of snail shells; slightly effervescent; moderately alkaline; clear smooth boundary.

Cg2—30 to 60 inches; dark gray (5Y 4/1) and light brownish gray (2.5Y 6/2), stratified loam and fine sandy loam, very dark gray (5Y 3/1) and grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable; common fine prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; common fine fragments of snail shells; slightly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 or 4 (2 to 3 moist)
Chroma—1 or 2
Texture—loam; silt loam, clay loam, or silty clay loam in some pedons

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 6 (2 to 5 moist)
Chroma—1 to 3
Texture—stratified loam and fine sandy loam; silt loam, loam, very fine sandy loam, fine sand, loamy fine sand, fine sandy loam, sandy clay loam, silty clay loam, or clay loam in some pedons

Clamo Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landform: Flood plains
Parent material: Clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Clamo silty clay, 0 to 1 percent slopes, 1,122 feet east and 245 feet north of the southwest corner of sec. 10, T. 107 N., R. 48 W., in Moody County, South Dakota;

USGS Flandreau, South Dakota, topographic quadrangle; lat. 44 degrees 4 minutes 53 seconds N. and long. 96 degrees 34 minutes 56 seconds W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; weak fine and medium granular structure; hard, firm, sticky and plastic; common very fine roots; neutral; abrupt smooth boundary.

A—9 to 13 inches; very dark gray (5Y 3/1) silty clay, black (5Y 2/1) moist; weak medium subangular blocky structure parting to weak fine and medium granular; hard, friable, sticky and plastic; common very fine and fine roots; neutral; clear wavy boundary.

Bg—13 to 27 inches; very dark gray (5Y 3/1) silty clay, black (5Y 2/1) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; common very fine and fine roots; neutral; clear wavy boundary.

Bkg1—27 to 39 inches; dark gray (5Y 4/1) silty clay, very dark gray (5Y 3/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; very hard, firm, sticky and plastic; few very fine roots; common fine soft masses of carbonate; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bkg2—39 to 60 inches; gray (5Y 6/1) silty clay loam, gray (5Y 5/1) moist; weak medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; common fine soft masses of carbonate; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 48 inches
Depth to carbonates: 14 to 30 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a C horizon.

A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay; silty clay loam, clay, or silt loam in some pedons

Bg horizon:
Hue—2.5Y, 5Y, or N
Value—3 to 5 (2 or 3 moist)
Chroma—0 to 2
Texture—silty clay; silty clay loam or clay in some pedons

Bkg horizon:
Hue—2.5Y or 5Y
Value—4 to 7 (2 to 5 moist)
Chroma—1 or 2
Texture—silty clay or silty clay loam; clay in some pedons

Clarno Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Moraines
Parent material: Loamy glacial till
Slope: 9 to 15 percent

Typical Pedon

Clarno loam, in an area of Ethan-Clarno loams, 9 to 15 percent slopes, 1,730 feet west and 495 feet north of the southeast corner of sec. 7, T. 108 N., R. 50 W., in Moody County, South Dakota; USGS Rutland NW, South Dakota, topographic quadrangle; lat. 44 degrees 10 minutes 6 seconds N. and long. 96 degrees 52 minutes 34 seconds W.

A—0 to 8 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; common very fine and fine roots; few very fine pores; few wormcasts; neutral; clear wavy boundary.

Bw—8 to 15 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable; common very fine and fine roots; few fine pores; few wormcasts; slightly alkaline; clear wavy boundary.

Bk1—15 to 24 inches; light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; few very fine and fine pores; common fine soft masses of carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—24 to 47 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; common fine prominent yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine pores; common fine and medium soft masses of carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—47 to 60 inches; pale yellow (2.5Y 7/4) clay loam, light yellowish brown (2.5Y 6/4) moist; common

fine prominent yellowish brown (10YR 5/8) and very dark brown (10YR 2/2) mottles; massive; hard, friable, slightly sticky and slightly plastic; few very fine pores; few fine soft masses of carbonate; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 20 inches
Depth to carbonates: 12 to 26 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam; silt loam or fine sandy loam in some pedons

Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5 (2 to 4 moist)
Chroma—2 or 3
Texture—loam or clay loam

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 8 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

Cubden Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Silty glacial till
Slope: 0 to 2 percent

Typical Pedon

Cubden silty clay loam, in an area of Cubden-Badger silty clay loams, 0 to 2 percent slopes, 2,125 feet north and 395 feet east of the southwest corner of sec. 8, T. 112 N., R. 52 W.; USGS Lake Poinsett, South Dakota, topographic quadrangle; lat. 44 degrees 31 minutes 13 seconds N. and long. 97 degrees 6 minutes 23 seconds W.

Ap—0 to 10 inches; gray (10YR 5/1) silty clay loam, black (10YR 2/1) moist; moderate coarse subangular blocky structure parting to moderate medium granular; hard, very friable, slightly sticky and slightly plastic; common very fine roots; 7 percent calcium strongly effervescent; slightly alkaline; abrupt smooth boundary.

ABk—10 to 15 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; few fine and common very fine pores; few fine masses of gypsum; 10 percent calcium carbonate; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bk1—15 to 26 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; very hard, friable, slightly sticky and slightly plastic; common very fine roots; few fine and common very fine pores; common fine and medium soft masses of carbonate and few fine masses of gypsum; 24 percent calcium carbonate; violently effervescent; slightly alkaline; clear wavy boundary.

Bk2—26 to 33 inches; light yellowish brown (2.5Y 6/3) silty clay loam, light olive brown (2.5Y 5/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; very hard, very friable, slightly sticky and slightly plastic; few fine roots; common very fine and few fine pores; common fine and medium soft masses of carbonate; 19 percent calcium carbonate; violently effervescent; slightly alkaline; clear wavy boundary.

C1—33 to 48 inches; light yellowish brown (2.5Y 6/3) silt loam, olive brown (2.5Y 4/3) moist; massive; very hard, very friable, slightly sticky and slightly plastic; few fine roots; common very fine and few fine pores; 12 percent calcium carbonate; few fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations and common medium prominent gray (10YR 6/1) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C2—48 to 60 inches; pale yellow (2.5Y 7/3) clay loam, olive brown (2.5Y 4/3) moist; massive; very hard, firm, sticky and plastic; few very fine and fine pores; common fine iron-manganese concretions; 10 percent calcium carbonate; common medium

prominent yellowish brown (10YR 5/8) redoximorphic concentrations and many medium prominent gray (10YR 6/1) redoximorphic depletions; 5 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 0 to 7 inches
Depth to contrasting parent material: More than 40 inches to loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 40 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (3 to 5 moist)
Chroma—1 to 4
Texture—silty clay loam or silt loam

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silt loam or silty clay loam

2C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

Darnen Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Till plains and moraines
Parent material: Local loamy alluvium
Slope: 2 to 6 percent

Typical Pedon

Darnen loam, 2 to 6 percent slopes, 750 feet west and 125 feet north of the southeast corner of sec. 18, T. 111 N., R. 47 W.; USGS White NE, South Dakota, topographic quadrangle; lat. 44 degrees 24 minutes 49 seconds N. and long. 96 degrees 30 minutes 28 seconds W.

A1—0 to 13 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; few very fine and fine pores; neutral; clear smooth boundary.

A2—13 to 29 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; few very fine and fine pores; neutral; clear smooth boundary.

Bw—29 to 46 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine and fine pores; neutral; clear smooth boundary.

Bk1—46 to 69 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine pores; few fine and medium soft masses of carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—69 to 80 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; common medium distinct dark yellowish brown (10YR 4/6) mottles; weak medium subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; few fine soft masses of carbonate; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 48 inches
Depth to carbonates: 20 to 60 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a C horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam; clay loam, silt loam, or sandy loam in some pedons

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (3 to 6 moist)

Chroma—2 to 6
Texture—loam or clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (3 to 6 moist)
Chroma—2 to 6
Texture—loam or silt loam; clay loam in some pedons

Davis Series

Depth to bedrock: Very deep
Drainage class: Well drained and moderately well drained
Permeability: Moderate
Landform: Till plains and flood plains
Parent material: Local loamy alluvium and loamy alluvium
Slope: 0 to 6 percent

Typical Pedon

Davis loam, 2 to 9 percent slopes, 2,225 feet east and 210 feet north of the southwest corner of sec. 5, T. 106 N., R. 48 W., in Moody County, South Dakota; USGS Flandreau, South Dakota, topographic quadrangle; lat. 44 degrees 0 minutes 30 seconds N. and long. 96 degrees 37 minutes 6 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak fine and medium granular structure; slightly hard, friable; many very fine and fine roots; common very fine pores; slightly acid; abrupt smooth boundary.
A—8 to 12 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable; many very fine and fine roots; common very fine and fine pores; many wormcasts; slightly acid; clear wavy boundary.
Bw1—12 to 21 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; hard, friable; common very fine and fine roots; common very fine pores; many wormcasts; neutral; gradual wavy boundary.
Bw2—21 to 32 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, friable; few very fine and fine roots; common very fine pores; common wormcasts; neutral; gradual smooth boundary.
Bw3—32 to 39 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable; few very fine roots; few very fine pores; neutral; gradual smooth boundary.
Bw4—39 to 48 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; neutral; clear smooth boundary.
Bk—48 to 60 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine soft masses of carbonate; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: More than 20 inches
Depth to carbonates: More than 20 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a C horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 3
Texture—loam, fine sandy loam, or sandy loam; silt loam, silty clay loam, or clay loam in some pedons

Bk horizon:
Hue—10YR or 2.5Y
Value—3 to 6 (2 to 5 moist)
Chroma—1 to 4
Texture—loam; silt loam, clay loam, silty clay loam, fine sandy loam, or sandy loam in some pedons

Dimo Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Flood plains

Parent material: Loamy alluvium over outwash
Slope: 0 to 2 percent

Typical Pedon

Dimo clay loam, 0 to 2 percent slopes, 380 feet south and 165 feet east of the northwest corner of sec. 1, T. 108 N., R. 50 W., in Moody County, South Dakota; USGS Medary, South Dakota, topographic quadrangle; lat. 44 degrees 11 minutes 41 seconds N. and long. 96 degrees 47 minutes 18 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine pores; neutral; abrupt smooth boundary.

Bw1—8 to 18 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine pores; common wormcasts; neutral; clear wavy boundary.

Bw2—18 to 27 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; common fine iron-manganese concretions and common wormcasts; light olive brown (2.5Y 5/6) redoximorphic concentrations and common fine prominent black (N 2/0) redoximorphic depletions; neutral; clear wavy boundary.

Bw3—27 to 31 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; slightly hard, very friable; few fine roots; common very fine and fine pores; common fine iron-manganese concretions and few wormcasts; few fine prominent light olive brown (2.5Y 5/6) redoximorphic concentrations and black (N 2/0) redoximorphic depletions; slightly alkaline; clear smooth boundary.

2C1—31 to 42 inches; light brownish gray (2.5Y 6/2) very gravelly sand, grayish brown (2.5Y 5/2) moist; single grain; loose; few discontinuous carbonate coats on sand and gravel; 45 percent gravel; strongly effervescent; moderately alkaline; gradual smooth boundary.

2C2—42 to 60 inches; grayish brown (2.5Y 5/2) very gravelly sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; few discontinuous carbonate coats on sand and gravel; 40 percent gravel; slightly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 40 inches
Depth to carbonates: 17 to 40 inches
Depth to contrasting parent material: 20 to 40 inches to gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a Bg horizon.

A horizon:
Hue—10YR or 2.5Y
Value—3 or 4 (2 moist)
Chroma—1 or 2
Texture—clay loam; loam, silt loam, or silty clay loam in some pedons

Bw horizon:
Hue—10YR, 2.5Y, or N
Value—3 to 5 (2 to 4 moist)
Chroma—0 to 2
Texture—loam or clay loam; sandy clay loam in some pedons

2C horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—very gravelly sand; gravelly sand, gravelly loamy sand, or very gravelly loamy sand in some pedons

Divide Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Flood plains
Parent material: Loamy alluvium over outwash
Slope: 0 to 2 percent

Typical Pedon

Divide loam, 0 to 2 percent slopes, 2,075 feet east and 108 feet north of the southwest corner of sec. 18, T. 112, R. 50 W.; USGS Estelline, South Dakota, topographic quadrangle; lat. 44 degrees 30 minutes 3 seconds N. and long. 96 degrees 52 minutes 51 seconds W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine and fine pores; 4 percent calcium carbonate; 2 percent

gravel; strongly effervescent; slightly alkaline; abrupt smooth boundary.

Ak—7 to 13 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; moderate medium and coarse subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; common very fine roots; few fine and common very fine pores; common medium and coarse soft masses of carbonate; 16 percent calcium carbonate; 2 percent gravel; violently effervescent; slightly alkaline; clear wavy boundary.

Bk1—13 to 19 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; moderate medium and coarse subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; common very fine roots; few fine and common very fine pores; common medium and coarse soft masses of carbonate; 18 percent calcium carbonate; 2 percent gravel; violently effervescent; slightly alkaline; clear wavy boundary.

Bk2—19 to 26 inches; light yellowish brown (2.5Y 6/3) loam, olive brown (2.5Y 4/3) moist; weak medium and coarse subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few very fine roots; few fine and common very fine pores; common medium and coarse soft masses of carbonate; 17 percent calcium carbonate; common fine brownish yellow (10YR 6/6) redoximorphic concentrations; 2 percent gravel; violently effervescent; slightly alkaline; abrupt wavy boundary.

2C1—26 to 31 inches; light olive brown (2.5Y 5/3) gravelly loamy sand, olive brown (2.5Y 4/3) moist; single grain; loose; common carbonate coats on rock fragments; 6 percent calcium carbonate; 30 percent gravel; slightly effervescent; slightly alkaline; gradual wavy boundary.

2C2—31 to 60 inches; light brownish gray (2.5Y 6/2) very gravelly loamy coarse sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; common carbonate coats on rock fragments; 4 percent calcium carbonate; 40 percent gravel; slightly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting parent material: 20 to 40 inches to gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 3 moist)
Chroma—1 or 2
Texture—loam; sandy loam, sandy clay loam, silt loam, or clay loam in some pedons

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 8 (3 to 7 moist)
Chroma—1 to 4
Texture—loam; clay loam or sandy clay loam in some pedons

2C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 6
Texture—gravelly loamy sand or very gravelly loamy coarse sand; gravelly sand or very gravelly sand in some pedons

Doland Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Loamy eolian material over loamy glacial till
Slope: 0 to 6 percent

Typical Pedon

Doland loam, in an area of Doland-Svea loams, 0 to 2 percent slopes, 1,530 feet west and 535 feet south of the northeast corner of sec. 18, T. 111 N., R. 50 W.; USGS Brookings, NE, South Dakota, topographic quadrangle; lat. 44 degrees 25 minutes 33 seconds N. and long. 96 degrees 52 minutes 21 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate medium granular; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; gravel; neutral; abrupt smooth boundary.

Bw1—8 to 13 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots; neutral; clear wavy boundary.

Bw2—13 to 21 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine roots; neutral; clear wavy boundary.

2Bk1—21 to 30 inches; light olive brown (2.5Y 5/3) clay loam, olive brown (2.5Y 4/3) moist; few medium prominent yellowish brown (10YR 5/8) mottles; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; few medium soft masses of carbonate; 3 percent gravel; violently effervescent; slightly alkaline; gradual wavy boundary.

2Bk2—30 to 39 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; few medium prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; hard, firm, slightly sticky and plastic; common medium soft masses of carbonate; 3 percent gravel; violently effervescent; slightly alkaline; gradual wavy boundary.

2C—39 to 60 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; many fine prominent yellowish brown (10YR 5/6) mottles; massive; hard, firm, sticky and plastic; 5 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 18 to 28 inches
Depth to contrasting parent material: 15 to 30 inches to loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (3 to 5 moist)
Chroma—2 to 4
Texture—loam or clay loam; silt loam in some pedons

2Bk horizon:
Hue—10YR or 2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 to 4
Texture—loam or clay loam

2C horizon:
Hue—2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

Egan Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Silty glacial till over loamy glacial till
Slope: 2 to 9 percent

Typical Pedon

Egan silty clay loam, in an area of Ethan-Egan complex, 6 to 9 percent slopes, 625 feet north and 615 feet west of the southeast corner of sec. 34, T. 109 N., R. 50 W.; USGS Medary, South Dakota, topographic quadrangle; lat. 44 degrees 11 minutes 50 seconds N. and long. 96 degrees 48 minutes 34 seconds W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium prismatic structure parting to moderate fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine to medium roots; common very fine and fine pores; few medium worm nodules; neutral; clear smooth boundary.

Bw—10 to 24 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; weak medium subangular blocky structure parting to moderate fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine pores; neutral; clear wavy boundary.

2Bk1—24 to 35 inches; light olive brown (2.5Y 5/3) clay loam, olive brown (2.5Y 4/3) moist; moderate medium subangular blocky structure parting to weak fine subangular blocky; slightly hard, firm, slightly sticky and slightly plastic; common very fine to medium roots; common very fine pores; very few carbonate coats on sand and gravel; common fine and medium soft masses of carbonate and common fine and medium dark reddish brown (5YR 3/4) soft masses of iron-manganese and few fine strong brown (7.5YR 5/6) soft masses of iron-manganese; 4 percent subrounded gravel; violently effervescent; moderately alkaline; clear wavy boundary.

2Bk2—35 to 44 inches; light olive brown (2.5Y 5/3) clay loam, olive brown (2.5Y 4/3) moist; few fine prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure parting to weak fine subangular blocky; hard, firm, sticky and plastic; common very fine roots; common very fine pores; very few carbonate coats on sand and gravel; common fine and medium soft

masses of carbonate and few fine strong brown (7.5YR 5/6) soft masses of iron-manganese; 4 percent subrounded gravel; violently effervescent; slightly alkaline; gradual wavy boundary.

2BC—44 to 57 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; few fine distinct grayish brown (2.5Y 5/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; common very fine roots; common very fine pores; few fine strong brown (7.5YR 4/6) soft masses of iron-manganese; 3 percent gravel; strongly effervescent; slightly alkaline; gradual wavy boundary.

2C1—57 to 72 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; few fine prominent yellowish brown (10YR 5/6) and few fine distinct grayish brown (2.5Y 5/2) mottles; massive; hard, firm, sticky and plastic; common very fine roots; few very fine pores; few fine strong brown (7.5YR 4/6) soft masses of iron-manganese; 3 percent gravel; strongly effervescent; slightly alkaline; gradual wavy boundary.

2C2—72 to 80 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; common fine and medium distinct grayish brown (2.5Y 5/2) mottles; massive; hard, firm, sticky and plastic; few very fine roots; few very fine pores; few fine and medium dark reddish brown (5YR 3/4) soft masses of iron-manganese; 4 percent subrounded gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 19 inches
Depth to carbonates: 15 to 30 inches
Depth to contrasting parent material: 24 to 40 inches to loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (3 or 4 moist)
Chroma—2 to 4
Texture—silty clay loam or silt loam

2Bk horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

2C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

Egeland Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Outwash plains
Parent material: Loamy glaciofluvial sediments
Slope: 0 to 9 percent

Typical Pedon

Egeland sandy loam, in an area of Egeland-Embden complex, 2 to 6 percent slopes, 1,600 feet east and 800 feet north of the southwest corner of sec. 8, T. 111 N., R. 50 W.; USGS Brookings NE, South Dakota, topographic quadrangle; lat. 44 degrees 25 minutes 48 seconds N. and long. 96 degrees 51 minutes 40 seconds W.

Ap—0 to 8 inches; dark gray (10YR 4/1) sandy loam, black (10YR 2/1) moist; weak medium subangular blocky structure; soft, very friable; few very fine and fine roots; few very fine pores; slightly acid; abrupt smooth boundary.

Bw1—8 to 14 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable; few very fine and fine roots; few very fine pores; neutral; clear smooth boundary.

Bw2—14 to 21 inches; light yellowish brown (2.5Y 6/3) sandy loam, light olive brown (2.5Y 5/3) moist; weak coarse subangular blocky structure; soft, very friable; few fine roots; common very fine pores; strongly effervescent; slightly alkaline; abrupt smooth boundary.

Bk—21 to 30 inches; light yellowish brown (2.5Y 6/3) sandy loam, light olive brown (2.5Y 5/3) moist; weak coarse subangular blocky structure; slightly hard, very friable; common very fine pores; strongly effervescent; slightly alkaline; clear wavy boundary.

C—30 to 80 inches; light yellowish brown (2.5Y 6/3) loamy sand, light olive brown (2.5Y 5/3) moist; single grain; soft, loose; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 16 inches
Depth to carbonates: 14 to 45 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—sandy loam; fine sandy loam or loam in some pedons

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (2 to 5 moist)
Chroma—1 to 4
Texture—sandy loam; fine sandy loam, loamy sand, or loamy fine sand in some pedons

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—sandy loam, loamy sand, or loamy fine sand; loamy very fine sand, very fine sandy loam, or fine sandy loam in some pedons

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—loamy sand; loamy fine sand, loamy very fine sand, sandy loam, very fine sandy loam, or fine sandy loam in some pedons

Embden Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderately rapid
Landform: Outwash plains
Parent material: Loamy glaciofluvial sediments
Slope: 0 to 6 percent

Typical Pedon

Embden fine sandy loam, in an area of Egeland-Embden complex, 2 to 6 percent slopes, 1,050 feet north and 1,100 feet west of the southeast corner of sec. 8, T. 111 N., R. 50 W.; USGS Brookings NE, South Dakota, topographic quadrangle; lat. 44 degrees 25 minutes 50 seconds N. and long. 96 degrees 51 minutes 6 seconds W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure parting to weak medium granular; soft, very friable; few very fine roots; slightly acid; abrupt smooth boundary.

A—10 to 16 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; soft, very friable; few very fine roots; slightly acid; clear smooth boundary.

Bw1—16 to 21 inches; brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, very friable; few very fine roots; neutral; clear smooth boundary.

Bw2—21 to 29 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure; soft, very friable; neutral; clear smooth boundary.

C1—29 to 34 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grain; loose; slightly effervescent; neutral; clear smooth boundary.

C2—34 to 38 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable; common medium distinct yellowish brown (10YR 5/6) redoximorphic concentrations; slightly effervescent; neutral; clear smooth boundary.

C3—38 to 80 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; single grain; loose; few medium distinct yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 40 inches
Depth to carbonates: 20 to 60 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a Bk horizon.

A horizon:
Hue—10YR or 2.5Y
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—fine sandy loam; sandy loam, very fine sandy loam, or loam in some pedons

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)

Chroma—1 to 4
Texture—fine sandy loam or loam; sandy loam or very fine sandy loam in some pedons

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—fine sandy loam, loamy fine sand, or loamy sand; sandy loam or very fine sandy loam in some pedons

Enet Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Flood plains
Parent material: Loamy alluvium over outwash
Slope: 0 to 2 percent

Typical Pedon

Enet loam, 0 to 2 percent slopes, rarely flooded, 1,320 feet south and 1,350 feet east of the northwest corner of sec. 1, T. 108 N., R. 50 W., in Moody County, South Dakota; USGS Medary, South Dakota, topographic quadrangle; lat. 44 degrees 11 minutes 31 seconds N. and long. 96 degrees 47 minutes 2 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; many very fine and fine roots; few very fine and fine pores; slightly acid; abrupt smooth boundary.
Bw1—8 to 22 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; soft, very friable; many very fine and fine roots; few very fine and fine pores; neutral; gradual wavy boundary.
Bw2—22 to 26 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; soft, very friable; common very fine and fine roots; few very fine and fine pores; neutral; clear smooth boundary.
2C1—26 to 42 inches; light yellowish brown (2.5Y 6/4), stratified very gravelly sand and gravelly sand, olive brown (2.5Y 4/4) moist; single grain; loose; few very fine and fine roots; few discontinuous carbonate coats on sand and gravel; 45 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.
2C2—42 to 60 inches; brown (10YR 5/3), stratified very gravelly sand and gravelly sand, brown (10YR 4/3) moist; single grain; loose; few discontinuous carbonate coats on sand and gravel; 45 percent gravel; slightly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 40 inches
Depth to carbonates: 20 to 40 inches
Depth to contrasting parent material: 20 to 40 inches to gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam; silt loam or fine sandy loam in some pedons

Bw horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 to 3
Texture—loam or sandy loam; clay loam or sandy clay loam in some pedons

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—stratified very gravelly sand and gravelly sand; gravelly loamy sand, gravelly sand, very gravelly loamy sand, or very gravelly sand in some pedons

Estelline Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Landform: Outwash plains
Parent material: Silty glaciofluvial deposits over outwash
Slope: 0 to 6 percent

Typical Pedon

Estelline silt loam (fig. 18), 0 to 2 percent slopes, 1,460 feet east and 160 feet north of the southwest corner of sec. 5, T. 112 N., R. 51 W.; USGS Estelline, South Dakota, topographic quadrangle; lat. 44 degrees 31 minutes 43 seconds N. and long. 96 degrees 58 minutes 54 seconds W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate medium granular; soft, friable, slightly sticky and slightly plastic; many fine roots; few very fine pores; slightly acid; abrupt smooth boundary.

Bw1—9 to 20 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and plastic; few fine roots; few very fine pores; slightly acid; clear wavy boundary.

Bw2—20 to 34 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and plastic; few fine roots; few very fine pores; neutral; clear smooth boundary.

Bk—34 to 37 inches; light yellowish brown (2.5Y 6/3) silty clay loam, olive brown (2.5Y 4/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and plastic; few very fine pores; few fine soft masses of carbonate; strongly effervescent; slightly alkaline; clear smooth boundary.

2C1—37 to 50 inches; pale brown (10YR 6/3) gravelly sand, brown (10YR 5/3) moist; single grain; loose; strongly effervescent; 15 percent gravel; slightly alkaline; gradual wavy boundary.

2C2—50 to 60 inches; very pale brown (10YR 7/3) gravelly sand, light olive brown (2.5Y 5/3) moist; single grain; loose; strongly effervescent; 20 percent gravel; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 25 inches
Depth to carbonates: 22 to 40 inches
Depth to contrasting parent material: 22 to 40 inches to gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silt loam or silty clay loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 4
Texture—silty clay loam or silt loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—silty clay loam; silt loam or loam in some pedons

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—gravelly sand; loamy sand, sand, or the gravelly analogs of these textures in some pedons

Ethan Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains and moraines
Parent material: Loamy glacial till
Slope: 2 to 15 percent

Typical Pedon

Ethan loam, in an area of Ethan-Egan complex, 6 to 9 percent slopes, 550 feet north and 600 feet west of the southeast corner of sec. 34, T. 109 N., R. 50 W.; USGS Medary, South Dakota, topographic quadrangle; lat. 44 degrees 11 minutes 49 seconds N. and long. 96 degrees 48 minutes 33 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine and common fine roots; common very fine and fine pores; common medium olive brown (2.5Y 4/3) wormcasts and common medium worm nodules; 4 percent calcium carbonate; 2 percent gravel; strongly effervescent; slightly alkaline; abrupt smooth boundary.

Bk1—8 to 16 inches; light olive brown (2.5Y 5/3) loam, olive brown (2.5Y 4/3) moist; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; 1- to 2-inch black (10YR 2/1) (moist) krotovina; common medium soft masses of carbonate and few fine and medium strong brown (7.5YR 4/6) soft masses of iron-manganese; 32 percent

calcium carbonate; 2 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—16 to 30 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; 1 cm of sandy loam between the Bk2 and Bk3 horizons; common medium and coarse soft masses of carbonate and few fine and medium strong brown (7.5YR 4/6) soft masses of iron-manganese and few fine and medium dark reddish brown (5YR 3/4) soft masses of iron-manganese; 28 percent calcium carbonate; 2 percent gravel; violently effervescent; moderately alkaline; abrupt smooth boundary.

Bk3—30 to 40 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; moderate coarse prismatic structure; slightly hard, firm, slightly sticky and slightly plastic; common very fine roots; common very fine pores; few fine and medium carbonate threads and few fine and medium yellowish brown (10YR 5/6) soft masses of iron-manganese and few fine and medium dark reddish brown (5YR 3/4) soft masses of iron-manganese; 21 percent calcium carbonate; 3 percent gravel; strongly effervescent; slightly alkaline; gradual wavy boundary.

BC—40 to 55 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; weak coarse prismatic structure; slightly hard, firm, slightly sticky and slightly plastic; common very fine roots; common very fine pores; few fine and medium dark reddish brown (5YR 3/4) soft masses of iron-manganese; 14 percent calcium carbonate; 3 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—55 to 80 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; massive; slightly hard, firm, slightly sticky and slightly plastic; common very fine roots; common very fine pores; few fine and medium dark reddish brown (5YR 3/4) soft masses of iron-manganese; 12 percent calcium carbonate; 3 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 10 inches
Depth to carbonates: 0 to 5 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 3 moist)
Chroma—2 or 3
Texture—loam; clay loam, silt loam, gravelly loam, loamy fine sand, or sandy loam in some pedons

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

C horizon:
Hue—2.5Y or 5Y
Value—5 to 8 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam; loam, silt loam, or fine sandy loam in some pedons

Fairdale Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 2 percent

Typical Pedon

Fairdale loam, channeled, 2,610 feet west and 230 feet south of the northeast corner of sec. 5, T. 109 N., R. 50 W.; USGS Brookings, South Dakota, topographic quadrangle; lat. 44 degrees 16 minutes 55 seconds N. and long. 96 degrees 51 minutes 30 seconds W.

A—0 to 6 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine pores; strongly effervescent; slightly alkaline; abrupt smooth boundary.

C1—6 to 15 inches; gray (10YR 5/1), stratified loam and sandy loam, very dark gray (10YR 3/1) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—15 to 23 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; massive; hard, friable,

slightly sticky and slightly plastic; common very fine roots; common very fine pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Ab—23 to 32 inches; dark gray (10YR 4/1), stratified loam, sandy loam, and silty clay loam, black (10YR 2/1) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine pores; common fine dark brown (7.5YR 3/2) iron-manganese concretions; strongly effervescent; slightly alkaline; abrupt smooth boundary.

C´—32 to 38 inches; light gray (10YR 7/2) and dark grayish brown (10YR 4/2), stratified loam, silt loam, and silty clay loam, light brownish gray (10YR 6/2) and very dark brown (10YR 2/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine brown (7.5YR 4/2) iron-manganese concretions; strongly effervescent; moderately alkaline; clear smooth boundary.

2C1—38 to 47 inches; light gray (10YR 7/2) and dark gray (10YR 4/1), stratified fine sand and silt loam, light brownish gray (10YR 6/2) and black (10YR 2/1) moist; massive; hard, friable, slightly sticky and slightly plastic; common fine prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; slightly effervescent; slightly alkaline; abrupt smooth boundary.

2C2—47 to 54 inches; gray (10YR 6/1) sand, dark gray (10YR 4/1) moist; single grain; loose; few fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; slightly effervescent; slightly alkaline; abrupt smooth boundary.

2C3—54 to 60 inches; dark gray (10YR 4/1), stratified loam and fine sand, black (10YR 2/1) moist; moderate medium platy structure; hard, very friable, slightly sticky and slightly plastic; common fine prominent brown (7.5YR 4/4) redoximorphic concentrations; slightly effervescent; slightly alkaline.

Range in Characteristics

Carbonates: At the surface
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—4 or 5 (2 or 3 moist)
Chroma—1 or 2
Texture—loam; silt loam, clay loam, fine sandy loam, very fine sandy loam, silty clay loam, or silty clay in some pedons

C horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (3 to 5 moist)
Chroma—1 to 4
Texture—stratified sandy loam, silt loam, silty clay loam, fine sand, and sand

Fordtown Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Flood plains
Parent material: Loamy alluvium over outwash
Slope: 0 to 2 percent

Typical Pedon

Fordtown loam, 0 to 2 percent slopes, 1,075 feet east and 115 feet south of the northwest corner of sec. 25, T. 111 N., R. 51 W.; USGS Bruce, South Dakota, topographic quadrangle; lat. 44 degrees 23 minutes 55 seconds N. and long. 96 degrees 54 minutes 18 seconds W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; moderate medium and coarse subangular blocky structure parting to moderate fine and medium granular; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine pores; 1 percent gravel; moderately acid; abrupt smooth boundary.

A—9 to 13 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine pores; 1 percent gravel; slightly acid; abrupt smooth boundary.

Bw1—13 to 21 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine pores; 1 percent gravel; neutral; clear wavy boundary.

Bw2—21 to 29 inches; light olive brown (2.5Y 5/3) loam, olive brown (2.5Y 4/3) moist; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, friable, sticky and plastic; common very fine

roots; common fine pores; common prominent continuous very dark gray (10YR 3/1) organic coats on vertical faces of peds; 3 percent gravel; neutral; abrupt wavy boundary.

2C1—29 to 45 inches; light yellowish brown (2.5Y 6/3) very gravelly sand, olive brown (2.5Y 4/3) moist; single grain; loose; many discontinuous carbonate coats on sand and gravel; 55 percent gravel; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2C2—45 to 63 inches; pale brown (10YR 6/3) very gravelly sand, brown (10YR 4/3) moist; single grain; loose; calcium carbonate coats on undersides of gravel; 35 percent gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

2C3—63 to 80 inches; pale yellow (2.5Y 7/3) sand, light olive brown (2.5Y 5/3) moist; single grain; loose; few calcium carbonate coats on undersides of gravel; 5 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 30 inches
Depth to carbonates: 17 to 40 inches
Depth to contrasting parent material: 20 to 40 inches to gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a buried horizon. Some pedons have a BC or Bk horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam; sandy loam or silt loam in some pedons

Bw horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 4
Texture—loam; silt loam, sandy loam, or clay loam in some pedons

2C horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—very gravelly sand or sand; gravelly sand, extremely gravelly sand, gravelly loamy sand, or gravelly coarse sand in some pedons

Fordville Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Outwash plains
Parent material: Loamy alluvium over outwash
Slope: 0 to 6 percent

Typical Pedon

Fordville loam, 0 to 2 percent slopes, 1,200 feet south and 150 feet east of the northwest corner of sec. 34, T. 110 N., R. 49 W.; USGS Aurora, South Dakota, topographic quadrangle; lat. 44 degrees 17 minutes 37 seconds N. and long. 96 degrees 42 minutes 25 seconds W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak coarse subangular blocky structure parting to moderate fine subangular blocky; hard, firm, slightly sticky and slightly plastic; common very fine and fine roots; common very fine pores; 2 percent gravel; neutral; abrupt smooth boundary.

Bw1—7 to 17 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to moderate coarse subangular blocky; hard, firm, slightly sticky and slightly plastic; common very fine roots; common very fine pores; 2 percent gravel; neutral; clear smooth boundary.

Bw2—17 to 24 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to strong medium subangular blocky; hard, firm, slightly sticky and slightly plastic; common very fine roots; common very fine pores; few faint discontinuous very dark gray (10YR 3/1) organic coats on vertical faces of peds; 2 percent gravel; neutral; clear smooth boundary.

BC—24 to 27 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak coarse prismatic structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; 10 percent gravel; neutral; abrupt smooth boundary.

2C1—27 to 33 inches; grayish brown (10YR 5/2) gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose; few discontinuous carbonate coats on sand and gravel; 30 percent gravel; slightly effervescent; slightly alkaline; clear smooth boundary.

2C2—33 to 42 inches; light yellowish brown (2.5Y 6/3) sand, light olive brown (2.5Y 5/3) moist; single grain; loose; few discontinuous carbonate coats on sand and gravel; 10 percent gravel; slightly effervescent; slightly alkaline; clear smooth boundary.

2C3—42 to 56 inches; light yellowish brown (2.5Y 6/3) gravelly sand, light olive brown (2.5Y 5/3) moist; single grain; loose; few discontinuous carbonate coats on sand and gravel; 17 percent gravel; slightly effervescent; slightly alkaline; clear smooth boundary.

2C4—56 to 60 inches; light yellowish brown (2.5Y 6/3) sand, light olive brown (2.5Y 5/3) moist; single grain; loose; few discontinuous carbonate coats on sand and gravel; 12 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 30 inches
Depth to carbonates: 17 to 40 inches
Depth to contrasting parent material: 20 to 40 inches to gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam or silt loam

Bw horizon:
Hue—10YR
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 4
Texture—loam; silt loam or clay loam in some pedons

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—sand, gravelly loamy sand, or gravelly sand

Goldsmith Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Landform: Outwash plains
Parent material: Silty glaciofluvial deposits over outwash
Slope: 0 to 2 percent

Typical Pedon

Goldsmith silty clay loam, 0 to 2 percent slopes, 2,250 feet north and 1,325 feet west of the southeast corner of sec. 15, T. 110 N., R. 51 W.; USGS Volga, South Dakota, topographic quadrangle; lat. 44 degrees 19 minutes 50 seconds N. and long. 96 degrees 55 minutes 56 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium and coarse angular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine and fine roots; strongly acid; abrupt smooth boundary.

A—8 to 23 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium and coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common fine pores and many very fine pores; common medium wormcasts; slightly acid; clear wavy boundary.

Bw1—23 to 33 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine pores; common faint continuous black (10YR 2/1) organic coats; slightly acid; clear wavy boundary.

Bw2—33 to 48 inches; light yellowish brown (2.5Y 6/3) silt loam, light olive brown (2.5Y 5/3) moist; moderate medium and coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine pores and common very fine pores; common prominent patchy very dark grayish brown (10YR 3/2) organic coats; few fine distinct yellowish brown (10YR 5/4) redoximorphic concentrations and common fine faint light brownish gray (2.5Y 6/2) redoximorphic depletions; neutral; abrupt wavy boundary.

2Bk—48 to 59 inches; light yellowish brown (2.5Y 6/3) gravelly loam, light olive brown (2.5Y 5/3) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine soft masses of carbonate; few fine distinct yellowish brown (10YR 5/4) redoximorphic

concentrations and common fine faint light brownish gray (2.5Y 6/2) redoximorphic depletions; common carbonate coats on rock fragments; 15 percent gravel; strongly effervescent; slightly alkaline; abrupt wavy boundary.

2C1—59 to 66 inches; light yellowish brown (2.5Y 6/3) gravelly loamy sand, light olive brown (2.5Y 5/3) moist; single grain; slightly hard, loose; few fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; few carbonate coats on rock fragments; 34 percent gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

2C2—66 to 80 inches; light yellowish brown (10YR 6/4) very gravelly sand, yellowish brown (10YR 5/4) moist; single grain; loose when moist and dry; few carbonate coats on rock fragments; 37 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 35 inches
Depth to carbonates: More than 16 inches
Depth to contrasting parent material: 40 to 60 inches to gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (3 or 4 moist)
Chroma—1 to 3
Texture—silt loam or loam; silty clay loam in some pedons

2Bk horizon:
Hue—10YR or 2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 to 4
Texture—loam or gravelly loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 8 (4 to 6 moist)
Chroma—2 to 6
Texture—gravelly loamy sand or very gravelly sand; loamy sand, sand, gravelly sand, or very gravelly loamy sand in some pedons

Hamerly Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Loamy glacial till
Slope: 0 to 2 percent

Typical Pedon

Hamerly loam (fig. 19), in an area of Hamerly-Badger complex, 0 to 2 percent slopes, 1,600 feet west and 450 feet south of the northeast corner of sec. 24, T. 112 N., R. 49 W.; USGS White, South Dakota, topographic quadrangle; lat. 44 degrees 29 minutes 53 seconds N. and long. 96 degrees 39 minutes 6 seconds W.

Ap—0 to 7 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; hard, friable, slightly sticky; few fine and medium roots; few very fine pores; 2 percent gravel; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bk1—7 to 13 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky; few fine and medium roots; few very fine and fine pores; few fine olive brown (2.5Y 4/3) wormcasts and common fine and medium soft masses of carbonate; 15 percent calcium carbonate; 2 percent gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—13 to 31 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky; few fine roots; few very fine and fine pores; few fine olive brown (2.5Y 4/3) wormcasts and common fine and medium soft masses of carbonate; 26 percent calcium carbonate; 2 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.

C1—31 to 42 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; massive; hard, friable, slightly sticky; few very fine pores; 13 percent calcium carbonate; few fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; 3 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—42 to 80 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist;

massive; hard, firm, slightly sticky; few very fine pores; 11 percent calcium carbonate; many fine and medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations and common fine and medium prominent gray (10YR 6/1) redoximorphic depletions; 3 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 0 to 6 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 40 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—loam; silt loam or clay loam in some pedons

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 8 (3 to 7 moist)
Chroma—1 to 4
Texture—loam or clay loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 8 (4 to 6 moist)
Chroma—1 to 4
Texture—clay loam or loam

Hetland Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Slow
Landform: Ice-walled lake plains
Parent material: Clayey glaciolacustrine sediments
Slope: 0 to 6 percent

Typical Pedon

Hetland silty clay loam, 2 to 6 percent slopes, 24 feet south and 45 feet west of the northeast corner of sec. 6, T. 110 N., R. 52 W.; USGS Lake Sinai, South Dakota, topographic quadrangle; lat. 44 degrees 22 minutes 9 seconds N. and long. 97 degrees 6 minutes 31 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure parting to weak medium subangular blocky; hard, friable, sticky and plastic; common very fine roots; few very fine pores; neutral; abrupt smooth boundary.

Bt1—8 to 21 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; very hard, friable, sticky and plastic; few very fine roots; few very fine pores; few discontinuous clay films on faces of peds and in pores; neutral; clear wavy boundary.

Bt2—21 to 24 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; very hard, friable, sticky and plastic; few very fine roots; few very fine pores; few discontinuous clay films on faces of peds and in pores; neutral; clear wavy boundary.

Bk—24 to 42 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; common fine distinct olive brown (2.5Y 4/4) and common medium prominent gray (10YR 5/1) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, slightly sticky and slightly plastic; few fine roots; few very fine pores; common fine and medium soft masses of carbonate; violently effervescent; moderately alkaline; gradual smooth boundary.

C—42 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; common medium prominent strong brown (7.5YR 4/6) mottles; massive; very hard, firm, slightly sticky and slightly plastic; few fine and medium soft masses of carbonate; violently effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 30 inches
Depth to carbonates: 16 to 32 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam or silty clay

Bt horizon:
Hue—10YR or 2.5Y

Value—3 to 6 (2 to 5 moist)
Chroma—1 to 3
Texture—silty clay loam or silty clay

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—silty clay loam or silty clay

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—silty clay loam or silt loam

Kranzburg Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Loess over loamy glacial till
Slope: 0 to 6 percent

Typical Pedon

Kranzburg silty clay loam (fig. 20), in an area of Kranzburg-Brookings silty clay loams, 1 to 6 percent slopes, 2,240 feet east and 660 feet south of the northwest corner of sec. 14, T. 111 N., R. 50 W.; USGS Brookings NE, South Dakota, topographic quadrangle; lat. 44 degrees 25 minutes 30 seconds N. and long. 96 degrees 47 minutes 57 seconds W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; hard, friable, slightly sticky and slightly plastic; common fine and few medium roots; few very fine pores; neutral; abrupt smooth boundary.

Bw1—9 to 18 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common fine and very fine pores; neutral; clear smooth boundary.

Bw2—18 to 25 inches; light olive brown (2.5Y 5/3) silty clay loam, olive brown (2.5Y 4/3) moist; moderate medium prismatic structure parting to weak medium and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine roots; common fine and very fine pores; slightly alkaline; clear wavy boundary.

2Bk1—25 to 29 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine pores; stone line with pebbles from 2 mm to 80 mm in diameter in the upper 1 1/2 inches; common medium accumulations of carbonate; few carbonate coatings on underside of gravel; strongly effervescent; 4 percent gravel; moderately alkaline; abrupt wavy boundary.

2Bk2—29 to 51 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; few fine distinct gray (2.5Y 6/1) mottles; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine pores; few carbonate coatings on underside of gravel; common fine and medium accumulations of carbonate; 3 percent gravel; strongly effervescent; moderately alkaline; gradual smooth boundary.

2Bk3—51 to 57 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; few fine distinct gray (2.5Y 6/1) and light olive brown (2.5Y 5/6) mottles; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine pores; few fine accumulations of carbonate; 3 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C—57 to 80 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; few fine distinct gray (2.5Y 6/1) and light olive brown (2.5Y 5/6) mottles; massive; hard, friable, slightly sticky and slightly plastic; common sand wedges 10 cm wide; 4 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 19 to 32 inches
Depth to contrasting parent material: 20 to 40 inches to loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—2 or 3
Texture—silty clay loam or silt loam

2Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

La Prairie Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 2 percent

Typical Pedon

La Prairie loam, 0 to 2 percent slopes, rarely flooded, 275 feet south and 300 feet west of the northeast corner of sec. 4, T. 110 N., R. 47 W.; USGS Lake Benton SW, Minnesota/South Dakota, topographic quadrangle; lat. 44 degrees 22 minutes 8 seconds N. and long. 96 degrees 28 minutes 2 seconds W.

A1—0 to 4 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; common very fine and fine pores; neutral; clear smooth boundary.

A2—4 to 14 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure parting to moderate fine and medium granular; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; common very fine and fine pores; neutral; clear smooth boundary.

Bw1—14 to 22 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; common very fine and fine pores; neutral; clear smooth boundary.

Bw2—22 to 39 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few very fine and fine pores; slightly alkaline; gradual wavy boundary.

Bk1—39 to 55 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few very fine and fine pores; few fine soft masses of carbonate; few fine prominent gray (10YR 6/1) redoximorphic depletions; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—55 to 80 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine pores; few fine and medium rounded carbonate threads; few fine prominent yellowish brown (10YR 5/6) and few fine distinct light olive brown (2.5Y 5/6) redoximorphic concentrations and common fine prominent gray (10YR 5/1) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 50 inches
Depth to carbonates: 0 to 40 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a C horizon.

A horizon:
Hue—10YR or N
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—loam; silt loam, clay loam, or silty clay loam in some pedons

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 3
Texture—loam; clay loam, silt loam, or silty clay loam in some pedons

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 7 (3 to 5 moist)
Chroma—1 to 4
Texture—silt loam; loam, clay loam, or silty clay loam in some pedons

LaDelle Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Flood plains
Parent material: Silty alluvium
Slope: 0 to 2 percent

Typical Pedon

LaDelle silt loam, 0 to 2 percent slopes, 950 feet east and 110 feet north of the southwest corner of sec. 2, T. 111 N., R. 51 W.; USGS Bruce, South Dakota, topographic quadrangle; lat. 44 degrees 26 minutes 32 seconds N. and long. 96 degrees 55 minutes 22 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; few fine pores; slightly acid; abrupt smooth boundary.

A—8 to 20 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine and medium roots; few fine pores; slightly acid; gradual smooth boundary.

Bw1—20 to 30 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine pores; slightly acid; gradual smooth boundary.

Bw2—30 to 38 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine pores; slightly acid; gradual smooth boundary.

Bw3—38 to 44 inches; light olive brown (2.5Y 5/3) silty clay loam, olive brown (2.5Y 4/3) moist; weak coarse subangular blocky structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine pores; few fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations; neutral; clear smooth boundary.

Bk1—44 to 50 inches; light olive brown (2.5Y 5/3) silty clay loam, olive brown (2.5Y 4/3) moist; weak coarse subangular blocky structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine soft masses of carbonate; few fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—50 to 64 inches; light yellowish brown (2.5Y 6/3) silty clay loam, light olive brown (2.5Y 5/3) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine soft masses of carbonate; few fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations and few fine distinct light brownish gray (2.5Y 6/2) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual smooth boundary.

C—64 to 80 inches; light yellowish brown (2.5Y 6/3) silt loam, light olive brown (2.5Y 5/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine soft masses of carbonate; common fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations and few fine distinct light brownish gray (2.5Y 6/2) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 17 to 50 inches
Depth to carbonates: 0 to 60 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 20 inches

A horizon:
Hue—10YR or N
Value—3 to 5 (2 or 3 moist)
Chroma—0 or 1
Texture—silt loam; silty clay loam or loam in some pedons

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—2 or 3
Texture—silt loam or silty clay loam; loam in some pedons

Bk horizon:
Hue—10YR or 2.5Y
Value—3 to 6 (2 to 5 moist)

Figure 15.—Profile of a Barnes loam. The surface layer is about 10 inches thick. Depth is marked in feet.

Figure 16.—Profile of a Brookings silty clay loam. This soil has about 2.5 feet of loess over loamy glacial till. Depth is marked in feet.

Figure 17.—Profile of a Buse loam. The surface layer is about 7 inches thick. Depth is marked in feet.

Figure 18.—Profile of an Estelline silt loam, which has gravelly material at a depth of about 2.5 feet. Depth is marked in feet.

Figure 19.—Profile of a Hamerly loam. This soil has a high content of carbonates within a depth of 16 inches. Depth is marked in feet.

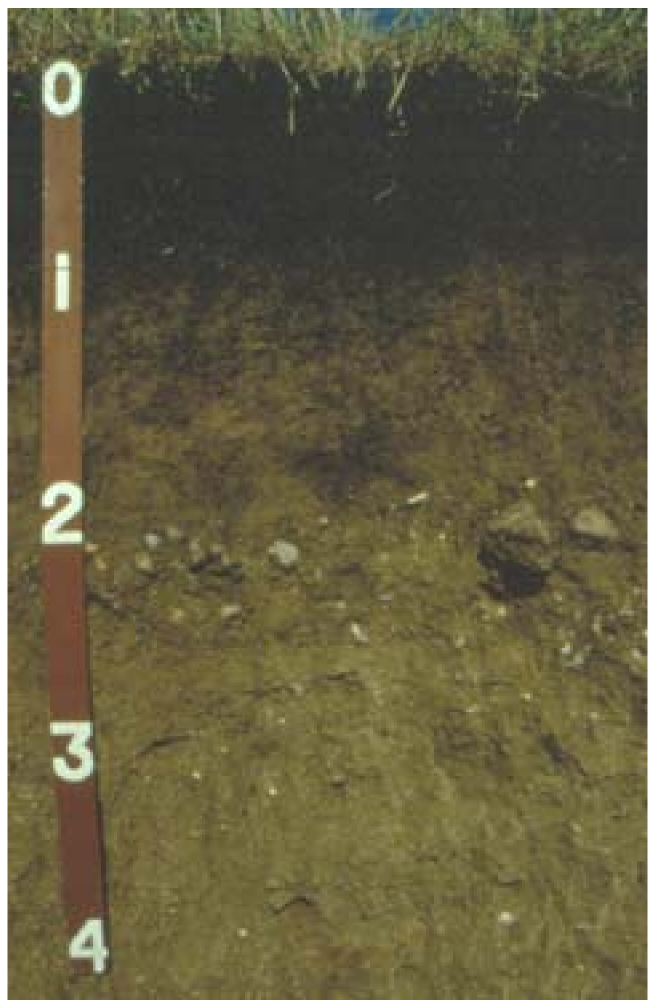

Figure 20.—Profile of a Kranzburg silty clay loam. This soil has about 2 feet of loess over loamy glacial till. Depth is marked in feet.

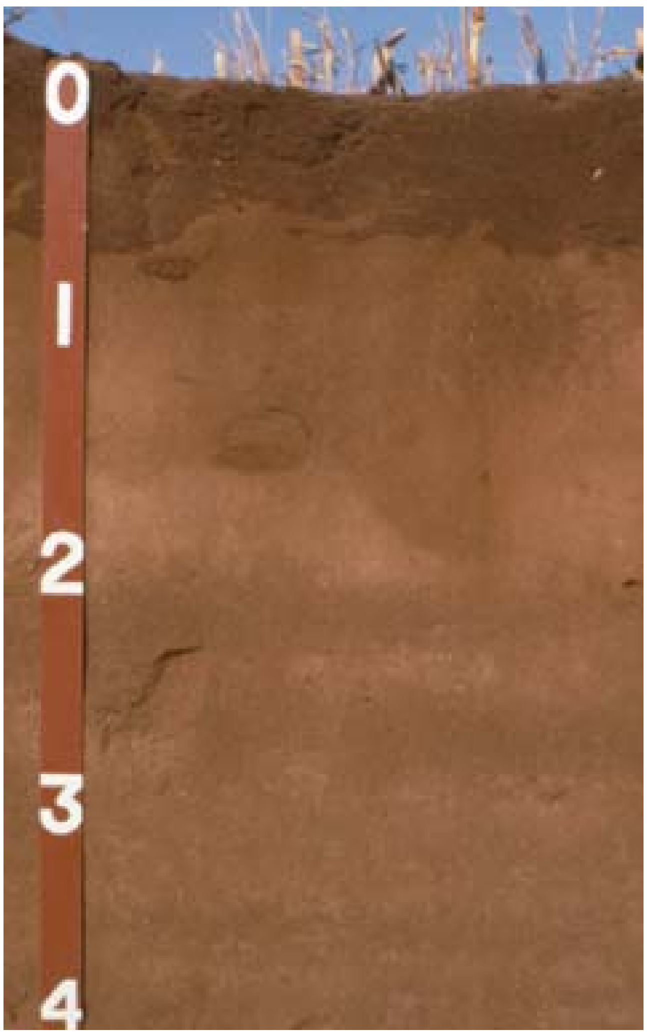

Figure 21.—Profile of a Maddock sandy loam. The surface layer is about 7 inches thick. Depth is marked in feet.

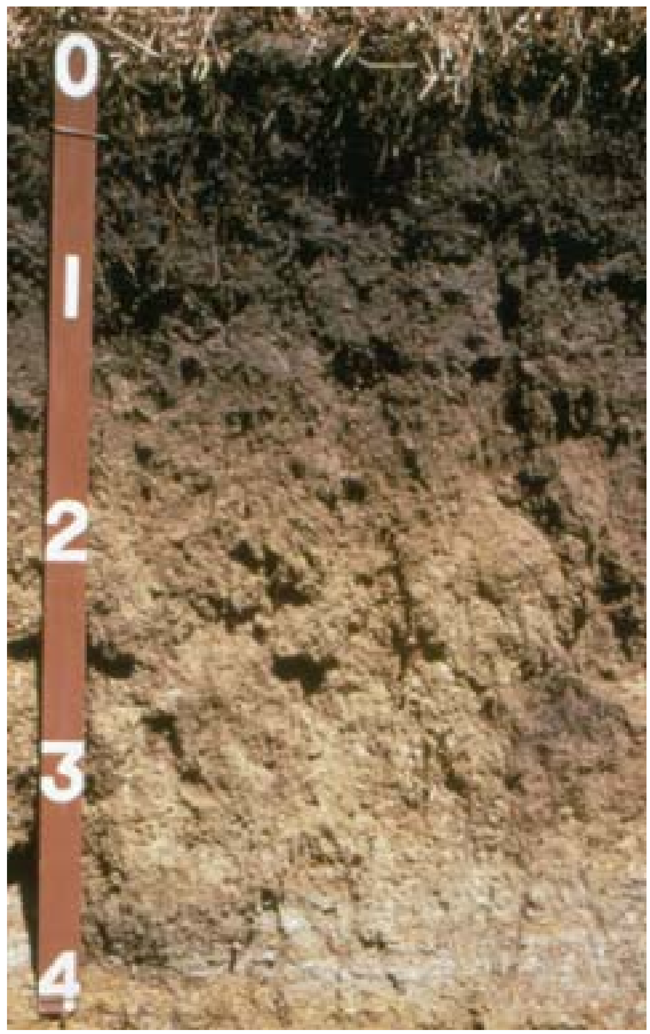

Figure 22.—Profile of a Poinsett silty clay loam. Silty glacial till is more than 4 feet thick over loamy glacial till. Depth is marked in feet.

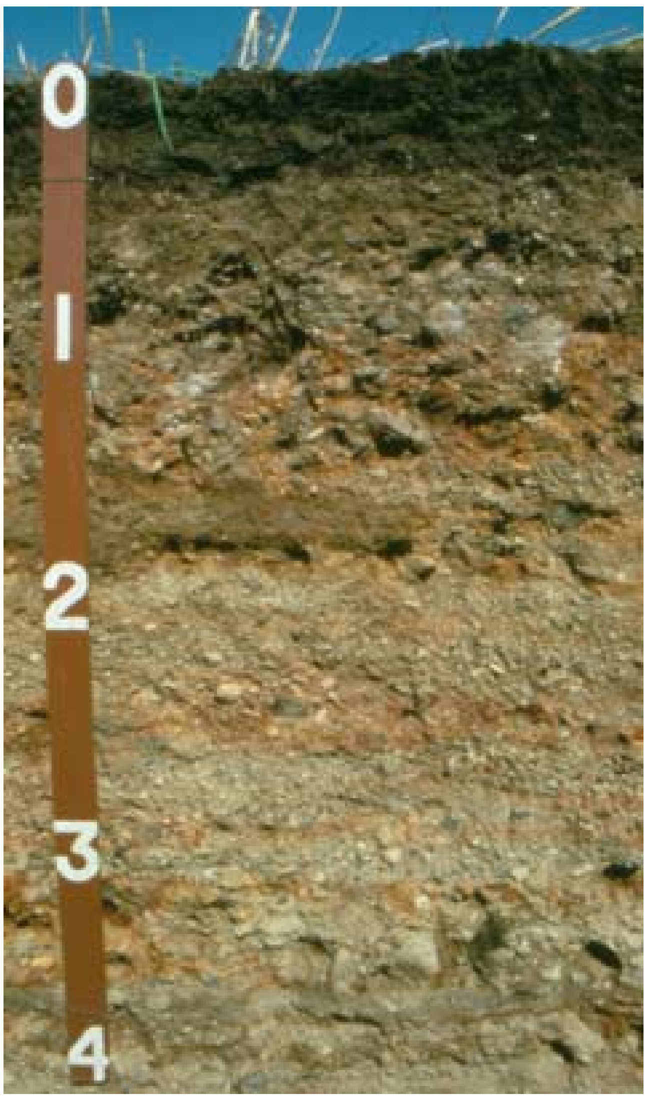

Figure 23.—Profile of a Sioux gravelly loam. The surface layer is about 4 inches thick over gravelly material. Depth is marked in feet.

Figure 24.—Profile of a Strayhoss loam. This soil has about 2 feet of loamy eolian material over sandy eolian material. Depth is marked in feet.

Figure 25.—Profile of a Swenoda sandy loam. Glacial till is at a depth of 2 to 3 feet. Depth is marked in feet.

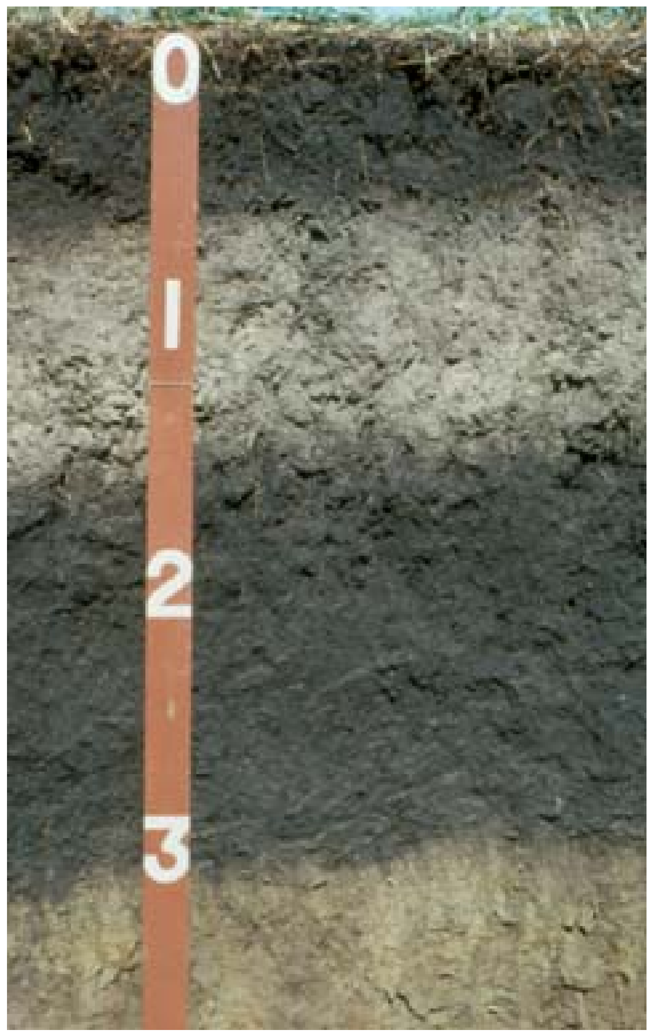

Figure 26.—Profile of a Tonka silty clay loam. The surface layer and subsurface layer are about 3 feet thick. Depth is marked in feet.

Chroma—1 to 3
Texture—silty clay loam; silt loam or loam in some pedons

C horizon:
Hue—10YR or 2.5Y
Value—3 to 7 (2 to 5 moist)
Chroma—1 to 4
Texture—silt loam; stratified silt loam to clay loam in some pedons

Lamo Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landform: Flood plains
Parent material: Silty alluvium
Slope: 0 to 1 percent

Typical Pedon

Lamo silty clay loam, 0 to 1 percent slopes, 690 feet east and 475 feet south of the northwest corner of sec. 15, T. 108 N., R. 49 W., in Moody County, South Dakota; USGS Flandreau NW, South Dakota, topographic quadrangle; lat. 44 degrees 9 minutes 57 seconds N. and long. 96 degrees 42 minutes 24 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine pores; slightly effervescent; slightly alkaline; abrupt smooth boundary.

A1—8 to 10 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine pores; slightly effervescent; slightly alkaline; clear wavy boundary.

A2—10 to 16 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine pores; common fine soft masses of carbonate; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bkg1—16 to 29 inches; gray (5Y 5/1) silty clay loam, very dark gray (5Y 3/1) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine pores; common fine soft masses of carbonate; few fine prominent light olive brown (2.5Y 5/4) redoximorphic concentrations; violently effervescent; moderately alkaline; gradual wavy boundary.

Bkg2—29 to 40 inches; gray (5Y 5/1) silty clay loam, dark gray (5Y 4/1) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine pores; common fine soft masses of carbonate; common fine prominent light olive brown (2.5Y 5/4) redoximorphic concentrations and common fine faint black (5Y 2/1) redoximorphic depletions; violently effervescent; moderately alkaline; gradual wavy boundary.

Cg1—40 to 54 inches; light olive gray (5Y 6/2) silt loam, olive gray (5Y 5/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine pores; common fine soft masses of carbonate; common fine prominent light olive brown (2.5Y 5/4) redoximorphic concentrations and black (N 2/0) redoximorphic depletions; violently effervescent; moderately alkaline; gradual wavy boundary.

Cg2—54 to 60 inches; light olive gray (5Y 6/2), stratified silt loam, olive gray (5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine pores; common fine soft masses of carbonate and few fine iron-manganese concretions; common fine prominent light olive brown (2.5Y 5/4) redoximorphic concentrations and black (N 2/0) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 39 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam; silt loam or loam in some pedons

Bkg horizon:
Hue—5Y or 2.5Y
Value—5 to 7 (3 to 6 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Cg horizon:
Hue—2.5Y, 5Y, or N
Value—5 or 6 (3 to 5 moist)
Chroma—0 to 2
Texture—silt loam or stratified silt loam; silty clay loam in some pedons

Lamoure Series

Depth to bedrock: Very deep
Drainage class: Poorly drained and somewhat poorly drained
Permeability: Moderately slow
Landform: Flood plains
Parent material: Silty alluvium
Slope: 0 to 1 percent

Typical Pedon

Lamoure silty clay loam, 0 to 1 percent slopes, 2,610 feet south and 150 feet west of the northeast corner of sec. 7, T. 112 N., R. 50 W.; USGS Estelline SE, South Dakota, topographic quadrangle; lat. 44 degrees 31 minutes 21 seconds N. and long. 96 degrees 52 minutes 3 seconds W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, sticky and plastic; common very fine and fine roots; few very fine pores; strongly effervescent; slightly alkaline; abrupt smooth boundary.

A1—8 to 17 inches; dark gray (N 4/0) silty clay loam, very dark gray (N 3/0) moist; moderate medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, sticky and plastic; few very fine roots; few very fine pores; strongly effervescent; slightly alkaline; clear wavy boundary.

A2—17 to 28 inches; dark gray (N 4/0) silty clay loam, black (N 2/0) moist; moderate medium subangular blocky structure parting to moderate medium granular; slightly hard, firm, sticky and plastic; few very fine roots; few very fine pores; few fine soft masses of carbonate; slightly effervescent; slightly alkaline; clear wavy boundary.

Cg—28 to 50 inches; gray (5Y 5/1) silty clay loam, dark gray (5Y 4/1) moist; massive; hard, firm, slightly sticky and slightly plastic; few very fine pores; few fine prominent dark brown (7.5YR 3/4) iron masses; common fine and medium soft masses of carbonate; violently effervescent; moderately alkaline; clear wavy boundary.

Ab—50 to 57 inches; very dark gray (N 3/0) silty clay loam, black (N 2/0) moist; massive; hard, firm, slightly sticky and slightly plastic; few very fine pores; slightly effervescent; slightly alkaline; abrupt wavy boundary.

2Cg—57 to 60 inches; grayish brown (2.5Y 5/2) gravelly loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, sticky and plastic; common fine and medium prominent strong brown (7.5YR 5/8) iron masses; few discontinuous carbonate coats on sand and gravel; slightly effervescent; 22 percent gravel; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: More than 24 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons do not have an Ab horizon.

A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 to 5 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam or silt loam

Cg horizon:
Hue—2.5Y, 5Y, or N
Value—4 to 8 (2 to 6 moist)
Chroma—0 to 2
Texture—silty clay loam or silt loam

Langhei Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Moraines
Parent material: Loamy glacial till
Slope: 15 to 40 percent

Typical Pedon

Langhei clay loam, in an area of Buse-Langhei complex, 15 to 40 percent slopes, 1,585 feet east and 750 feet south of the northwest corner of sec. 18, T. 111 N., R. 47 W.; USGS White NE, South Dakota, topographic quadrangle; lat. 44 degrees 25 minutes 29 seconds N. and long. 96 degrees 31 minutes 10 seconds W.

A—0 to 3 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong very fine subangular blocky structure; slightly hard, firm, sticky and plastic; many very fine and

fine roots; 2 percent gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk1—3 to 10 inches; light olive brown (2.5Y 5/3) clay loam, olive brown (2.5Y 4/3) moist; weak medium subangular blocky structure parting to strong very fine and fine subangular blocky; slightly hard, firm, sticky and plastic; common very fine and fine roots; many carbonate coats on rock fragments; 3 percent gravel and 1 percent shale; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk2—10 to 14 inches; light olive brown (2.5Y 5/3) clay loam, olive brown (2.5Y 4/3) moist; common fine faint dark grayish brown (2.5Y 4/2), common fine distinct gray (2.5Y 5/1), and common fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure parting to strong very fine and fine subangular blocky; slightly hard, firm, sticky and plastic; common very fine and fine roots; many carbonate coats on rock fragments; few soft masses of carbonate; 3 percent gravel and 1 percent shale; strongly effervescent; moderately alkaline; clear wavy boundary.

C—14 to 80 inches; light olive brown (2.5Y 5/3) clay loam, olive brown (2.5Y 4/3) moist; few fine and medium prominent yellowish brown (10YR 5/8), common fine prominent yellowish brown (10YR 5/6), and common fine and medium distinct gray (2.5Y 5/1) mottles; massive; hard, very firm, very sticky and very plastic; many carbonate coats on rock fragments; common dark brown (7.5YR 3/2) iron-manganese concretions; 5 percent gravel and 2 percent shale; strongly effervescent; slightly alkaline.

Range in Characteristics

Carbonates: At or near the surface
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (3 to 5 moist)
Chroma—1 or 2
Texture—clay loam or loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 8 (4 to 7 moist)
Chroma—2 to 4
Texture—clay loam or loam

Lanona Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately rapid in the loamy sediments and moderately slow in the underlying material
Landform: Till plains
Parent material: Loamy glaciofluvial sediments over loamy glacial till or glaciolacustrine sediments
Slope: 0 to 6 percent

Typical Pedon

Lanona sandy loam, in an area of Lanona-Swenoda sandy loams, 2 to 6 percent slopes, 2,050 feet north and 1,100 feet west of the southeast corner of sec. 4, T. 110 N., R. 47 W.; USGS Lake Benton SW, Minnesota/South Dakota, topographic quadrangle; lat. 44 degrees 21 minutes 39 seconds N. and long. 96 degrees 28 minutes 20 seconds W.

Ap—0 to 8 inches; dark gray (10YR 4/1) sandy loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and medium roots; few very fine and fine pores; neutral; abrupt smooth boundary.

Bw1—8 to 14 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine and medium roots; few very fine and fine pores; neutral; clear wavy boundary.

Bw2—14 to 34 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine and medium roots; few very fine and fine pores; neutral; abrupt wavy boundary.

2Bk—34 to 50 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; few fine prominent yellowish brown (10YR 5/6) and few fine distinct grayish brown (2.5Y 5/2) mottles; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine pores; common fine soft masses

of carbonate; strongly effervescent; moderately alkaline; abrupt wavy boundary.

3C—50 to 80 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; few fine prominent yellowish brown (10YR 5/6) and few fine distinct grayish brown (2.5Y 5/2) mottles; massive; hard, firm, slightly sticky and plastic; few very fine and fine pores; few fine soft masses of carbonate; 3 percent gravel; slightly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 14 to 46 inches
Depth to contrasting parent material: 20 to 40 inches to glacial till or glaciolacustrine sediments
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—sandy loam; loam or fine sandy loam in some pedons

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (2 to 5 moist)
Chroma—1 to 4
Texture—fine sandy loam or sandy loam

2Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—6 or 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silt loam; loam, clay loam, or silty clay loam in some pedons

2C horizon:
Hue—2.5Y or 5Y
Value—6 or 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam; loam or silt loam in some pedons

Lowe Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Moderate
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 1 percent

Typical Pedon

Lowe loam, 0 to 1 percent slopes, 800 feet east and 630 feet north of the southwest corner of sec. 10, T. 109 N., R. 49 W.; USGS Aurora, South Dakota, topographic quadrangle; lat. 44 degrees 15 minutes 19 seconds N. and long. 96 degrees 42 minutes 15 seconds W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate fine granular; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine pores; 8 percent calcium carbonate; 1 percent gravel; strongly effervescent; slightly alkaline; abrupt smooth boundary.

Bkg1—10 to 24 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable, sticky and plastic; common very fine roots; many very fine and fine pores; many fine soft masses of carbonate; 24 percent calcium carbonate; 1 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.

Bkg2—24 to 36 inches; gray (10YR 5/1) clay loam, dark gray (10YR 4/1) moist; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable, sticky and plastic; common very fine roots; common very fine pores; many fine and medium soft masses of carbonate; 29 percent calcium carbonate; 1 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.

Cg1—36 to 55 inches; gray (5Y 5/1), stratified clay loam, dark gray (5Y 4/1) moist; weak medium prismatic structure parting to weak coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; common fine soft masses of carbonate; 14 percent calcium carbonate; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; 1 percent gravel; violently effervescent; slightly alkaline; clear wavy boundary.

Cg2—55 to 70 inches; gray (5Y 5/1), stratified loam, dark gray (5Y 4/1) moist; massive; hard, friable, slightly sticky and slightly plastic; 9 percent calcium carbonate; common medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; 1 percent gravel; strongly effervescent; slightly alkaline; gradual wavy boundary.

Cg3—70 to 80 inches; light olive gray (5Y 6/2), stratified sandy loam, olive gray (5Y 5/2) moist; massive; slightly hard, very friable; 4 percent calcium carbonate; many medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations; 1 percent gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 36 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 15 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—loam; clay loam, silt loam, or silty clay loam in some pedons

Bkg horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 to 7 (2 to 5 moist)
Chroma—0 to 2
Texture—clay loam or loam; silt loam in some pedons

Cg horizon:
Hue—5Y or 2.5Y
Value—4 to 7 (3 to 6 moist)
Chroma—1 to 3
Texture—stratified loam, clay loam, and sandy loam; silty clay loam, sandy clay loam, or loamy sand in some pedons

Ludden Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landform: Flood plains
Parent material: Clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Ludden silty clay, in an area of Ludden, saline-Ludden silty clays, 0 to 1 percent slopes, 800 feet south and 600 feet east of the northwest corner of sec. 8, T. 109 N., R. 50 W.; USGS Brookings, South Dakota, topographic quadrangle; lat. 44 degrees 15 minutes 58 seconds N. and long. 96 degrees 52 minutes 0 seconds W.

A—0 to 9 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; common very fine and fine roots; few snail-shell fragments; slightly effervescent; neutral; clear smooth boundary.

Bg—9 to 22 inches; dark gray (N 4/0) silty clay, black (N 2.5/0) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; common very fine and fine roots; few snail-shell fragments; slightly effervescent; moderately alkaline; clear wavy boundary.

Bkg—22 to 40 inches; dark gray (N 4/0) clay, black (N 2.5/0) moist; weak coarse prismatic structure; very hard, very firm, very sticky and very plastic; few very fine and fine roots; few fine soft masses of carbonate; violently effervescent; moderately alkaline; gradual wavy boundary.

Cg—40 to 60 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; massive; very hard, very firm, very sticky and very plastic; few very fine and fine roots; few fine soft masses of carbonate; few fine prominent strong brown (7.5YR 4/6) redoximorphic concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 48 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 40 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 to 5 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay; clay or silty clay loam in some pedons

Bg horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—4 to 6 (2 to 4 moist)
Chroma—0 to 2
Texture—clay or silty clay; silty clay loam in some pedons

Cg horizon:
Hue—2.5Y, 5Y, or N
Value—3 to 6 (2 to 5 moist)

Chroma—0 to 2
Texture—clay or silty clay

Maddock Series

Depth to bedrock: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Landform: Outwash plains
Parent material: Sandy glaciofluvial sediments
Slope: 0 to 9 percent

Typical Pedon

Maddock sandy loam (fig. 21), in an area of Maddock-Embden complex, 0 to 2 percent slopes, 2,400 feet south and 300 feet west of the northeast corner of sec. 13, T. 111 N., R. 51 W.; USGS Bruce, South Dakota, topographic quadrangle; lat. 44 degrees 25 minutes 15 seconds N. and long. 96 degrees 53 minutes 14 seconds W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) sandy loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, very friable; few very fine roots; slightly alkaline; abrupt smooth boundary.
Bw—7 to 20 inches; brown (10YR 4/3) loamy sand, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; few very fine roots; slightly alkaline; clear smooth boundary.
C1—20 to 40 inches; brown (10YR 5/3) sand, brown (10YR 4/3) moist; single grain; loose; slightly alkaline; clear smooth boundary.
C2—40 to 56 inches; yellowish brown (10YR 5/4) sand, dark yellowish brown (10YR 4/4) moist; single grain; loose; strongly effervescent; slightly alkaline; gradual wavy boundary.
C3—56 to 80 inches; yellowish brown (10YR 5/4) loamy sand, dark yellowish brown (10YR 4/4) moist; single grain; loose; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 0 to more than 60 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—sandy loam; loamy fine sand, fine sandy loam, loam, fine sand, or loamy sand in some pedons

Bw horizon:
Hue—10YR
Value—4 to 6 (2 to 5 moist)
Chroma—2 to 4
Texture—loamy sand; fine sand or loamy fine sand in some pedons

C horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—sand or loamy sand; fine sand or loamy fine sand in some pedons

Marysland Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Flood plains
Parent material: Loamy alluvium over outwash
Slope: 0 to 1 percent

Typical Pedon

Marysland loam, 0 to 1 percent slopes, 1,400 feet east and 475 feet north of the southwest corner of sec. 25, T. 109 N., R. 50 W.; USGS Medary, South Dakota, topographic quadrangle; lat. 44 degrees 12 minutes 41 seconds N. and long. 96 degrees 46 minutes 54 seconds W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine to medium roots; common very fine to medium pores; 14 percent calcium carbonate; strongly effervescent; slightly alkaline; abrupt smooth boundary.
Ak—9 to 14 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine to medium roots; common very fine and fine pores; many medium soft masses of carbonate; 25 percent calcium carbonate; violently effervescent; moderately alkaline; clear wavy boundary.

Bkg1—14 to 23 inches; gray (2.5Y 5/1) clay loam, dark gray (2.5Y 4/1) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine and fine pores; many medium soft masses of carbonate; 35 percent calcium carbonate; common fine faint dark grayish brown (2.5Y 4/2) redoximorphic depletions; 1 percent gravel; violently effervescent; moderately alkaline; clear smooth boundary.

Bkg2—23 to 33 inches; gray (2.5Y 5/1) clay loam, dark gray (2.5Y 4/1) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine and fine pores; many medium soft masses of carbonate; 26 percent calcium carbonate; common fine and medium distinct light olive brown (2.5Y 5/4) redoximorphic concentrations; 2 percent gravel; violently effervescent; moderately alkaline; clear smooth boundary.

Bkg3—33 to 38 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine pores; common fine and medium very dark gray (10YR 3/1) iron-manganese concretions and common fine soft masses of carbonate; 15 percent calcium carbonate; common medium prominent strong brown (7.5YR 4/6) and yellowish brown (10YR 5/8) redoximorphic concentrations; 10 percent gravel; strongly effervescent; slightly alkaline; abrupt smooth boundary.

2Cg1—38 to 50 inches; light brownish gray (2.5Y 6/2) very gravelly sand, grayish brown (2.5Y 5/2) moist; single grain; loose; very few discontinuous carbonate coats on sand and gravel; common fine and medium very dark gray (10YR 3/1) iron-manganese concretions; 10 percent calcium carbonate; many medium and coarse prominent dark brown (7.5YR 3/4), common medium prominent strong brown (7.5YR 4/6), and common fine and medium prominent yellowish brown (10YR 5/8) redoximorphic concentrations; 40 percent gravel; slightly effervescent; slightly alkaline; gradual wavy boundary.

2Cg2—50 to 60 inches; light brownish gray (2.5Y 6/2) fine sand, grayish brown (2.5Y 5/2) moist; single grain; loose; 9 percent calcium carbonate; common fine prominent strong brown (7.5YR 4/6) and yellowish brown (10YR 5/6) redoximorphic concentrations; very slightly effervescent; slightly alkaline; gradual wavy boundary.

2Cg3—60 to 80 inches; light brownish gray (2.5Y 6/2) gravelly sand, grayish brown (2.5Y 5/2) moist; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; single grain; loose; very few discontinuous carbonate coats on sand and gravel; 4 percent calcium carbonate; 20 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 30 inches
Depth to carbonates: 0 to 7 inches
Depth to contrasting parent material: 20 to 40 inches to gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—loam; silt loam, sandy clay loam, or clay loam in some pedons

Bkg horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—4 to 8 (3 to 6 moist)
Chroma—0 to 2
Texture—clay loam or loam; sandy clay loam, fine sandy loam, or sandy loam in some pedons

2Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 7 (3 to 6 moist)
Chroma—1 or 2
Texture—very gravelly sand, fine sand, or gravelly sand; loamy sand, loamy coarse sand, gravelly coarse sand, or very gravelly coarse sand in some pedons

McIntosh Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Loess over loamy glacial till
Slope: 0 to 2 percent

Typical Pedon

McIntosh silty clay loam, in an area of McIntosh-Badger silty clay loams, 0 to 2 percent slopes, 1,530 feet west and 70 feet south of the northeast corner of sec. 13, T. 112 N., R. 49 W.; USGS Toronto, South Dakota, topographic quadrangle; lat. 44 degrees 30

minutes 46 seconds N. and long. 96 degrees 39 minutes 8 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate fine and medium granular structure; hard, friable, slightly sticky and slightly plastic; common fine roots; few very fine pores; 4 percent calcium carbonate; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Ak—8 to 15 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium and coarse subangular blocky structure parting to moderate fine and medium granular; hard, friable, slightly sticky and slightly plastic; common fine roots; few very fine pores; few fine soft masses of carbonate; 15 percent calcium carbonate; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk1—15 to 19 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine roots; few very fine pores; common fine soft masses of carbonate; 17 percent calcium carbonate; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—19 to 31 inches; light yellowish brown (2.5Y 6/3) silty clay loam, light olive brown (2.5Y 5/3) moist; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine pores; common fine soft masses of carbonate; 18 percent calcium carbonate; violently effervescent; moderately alkaline; abrupt wavy boundary.

2C1—31 to 41 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine pores; 14 percent calcium carbonate; few fine prominent gray (10YR 6/1) redoximorphic depletions; 2 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C2—41 to 68 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; common fine and medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations and common fine prominent gray (10YR 6/1) redoximorphic depletions; 2 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C3—68 to 80 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; massive; hard, friable, slightly sticky and slightly plastic; common fine and medium prominent yellowish red (5YR 4/6) and common fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; 2 percent gravel; slightly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Carbonates: At the surface
Depth to contrasting parent material: 24 to 40 inches to glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 10 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 or 4 (2 to 3 moist)
Chroma—1 or 2
Texture—silty clay loam; silt loam or loam in some pedons

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—silty clay loam; silt loam or loam in some pedons

2C horizon:
Hue—2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—3 to 6
Texture—loam or clay loam

Minnewaukan Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Rapid
Landform: Lake plains
Parent material: Sandy lacustrine sediments
Slope: 0 to 3 percent

Typical Pedon

Minnewaukan loamy sand, 830 feet east and 650 feet south of the northwest corner of sec. 14, T. 113 N., R. 52 W., in Hamlin County, South Dakota; USGS Lake Poinsett, South Dakota, topographic quadrangle; lat. 44 degrees 35 minutes 51 seconds N. and long. 97 degrees 2 minutes 31 seconds W.

A—0 to 5 inches; dark gray (10YR 4/1) loamy sand, black (10YR 2/1) moist; weak fine subangular blocky and weak fine granular structure; loose, very friable; many fine roots; slightly alkaline; clear wavy boundary.

AC—5 to 9 inches; dark gray (10YR 4/1) loamy sand,

very dark gray (10YR 3/1) moist; single grain; loose; common fine roots; very slight effervescence; slightly alkaline; clear wavy boundary.

C1—9 to 12 inches; grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) medium and coarse sand, dark grayish brown (2.5Y 4/2) and light brownish gray (2.5Y 6/2) moist; single grain; loose; few very fine roots; very slight effervescence; slightly alkaline; clear wavy boundary.

C2—12 to 17 inches; light brownish gray (10YR 6/2) and gray (10YR 5/1) medium and coarse sand, light brownish gray (2.5Y 6/2) and very dark gray (10YR 3/1) moist; single grain; loose; 1-inch strata of very coarse sand; slight effervescence; moderately alkaline; abrupt wavy boundary.

C3—17 to 60 inches; light brownish gray (2.5Y 6/2) coarse to fine sand, grayish brown (2.5Y 5/2) moist; single grain; loose; very slight effervescence; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 30 inches

A horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 6 (2 to 4 moist)
Chroma—1 or 2
Texture—loamy sand; loamy fine sand, loamy coarse sand, fine sandy loam, sandy loam, or sand in some pedons

C horizon:
Hue—10YR, 2.5Y, 5Y, or 5GY
Value—4 to 7 (3 to 5 moist)
Chroma—1 to 4
Texture—sand; loamy sand or fine sand in some pedons

Moritz Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 2 percent

Typical Pedon

Moritz loam, in an area of Moritz-Lamoure complex, 0 to 2 percent slopes, 1,750 feet south and 600 feet east of the northwest corner of sec. 12, T. 111 N., R. 48 W.; USGS White NE, South Dakota, topographic quadrangle; lat. 44 degrees 26 minutes 10 seconds N. and long. 96 degrees 32 minutes 33 seconds W.

A1—0 to 10 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; few very fine and fine pores; 3 percent calcium carbonate; slightly effervescent; neutral; clear smooth boundary.

A2—10 to 15 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; few very fine and fine pores; 11 percent calcium carbonate; slightly effervescent; neutral; clear smooth boundary.

Bk1—15 to 24 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; few very fine and fine pores; common fine soft masses of carbonate; 21 percent calcium carbonate; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—24 to 42 inches; light yellowish brown (2.5Y 6/3) loam, olive brown (2.5Y 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and medium roots; few very fine and fine pores; few fine soft masses of carbonate; 15 percent calcium carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—42 to 61 inches; light gray (5Y 7/2) clay loam, olive gray (5Y 5/2) moist; massive; slightly hard, firm, slightly sticky and plastic; 6 percent calcium carbonate; common medium prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; gradual wavy boundary.

Ab—61 to 80 inches; olive gray (5Y 5/2) loam, dark olive gray (5Y 3/2) moist; massive; slightly hard, firm, slightly sticky and slightly plastic; 13 percent calcium carbonate; common medium prominent light olive brown (2.5Y 5/6) redoximorphic concentrations; strongly effervescent; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 24 inches
Depth to carbonates: 0 to 6 inches
Depth to contrasting parent material: More than 60 inches

Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR or N
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—loam; clay loam, silty clay loam, or silt loam in some pedons

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 7 (3 to 6 moist)
Chroma—1 to 3
Texture—loam; clay loam, silt loam, silty clay loam, or sandy loam in some pedons

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—clay loam; stratified silt loam, loamy sand, clay loam, silty clay loam, loam, or sandy loam in some pedons

Oldham Series

Depth to bedrock: Very deep
Drainage class: Very poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Oldham silty clay loam, 0 to 1 percent slopes, 1,050 feet west and 450 feet north of the southeast corner of sec. 6, T. 109 N., R. 52 W.; USGS Lake Sinai, South Dakota, topographic quadrangle; lat. 44 degrees 16 minutes 8 seconds N. and long. 97 degrees 6 minutes 43 seconds W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; few snail shells; common very fine roots; few very fine pores; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bg—9 to 19 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots; few very fine pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bkg—19 to 31 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; very hard, firm, sticky and plastic; few very fine roots; few very fine pores; common medium and coarse accumulations of carbonate; few fine distinct light gray (10YR 7/1) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual irregular boundary.

Bkgy—31 to 40 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; few very fine pores; common fine and medium accumulations of carbonate; common fine gypsum crystals and other salts; few fine prominent strong brown (7.5YR 5/8) redoximorphic concentrations; strongly effervescent; moderately alkaline; gradual irregular boundary.

Cg1—40 to 60 inches; light gray (5Y 7/2) silt loam, olive gray (5Y 5/2) moist; massive; very hard, firm, slightly sticky and slightly plastic; common fine dark brown (7.5YR 3/2) soft masses of iron-manganese; many fine and medium prominent strong brown (7.5YR 5/8) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cg2—60 to 72 inches; light olive gray (5Y 6/2) silt loam, olive gray (5Y 5/2) moist; massive; very hard, firm, slightly sticky and slightly plastic; common fine dark brown (7.5YR 3/2) soft masses of iron-manganese; common fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cg3—72 to 80 inches; light olive gray (5Y 6/2) silty clay loam, olive gray (5Y 5/2) moist; massive; very hard, firm, slightly sticky and slightly plastic; few fine dark brown (7.5YR 3/2) soft masses of iron-manganese; common fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 60 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 20 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 or 4 (2 or 3 moist)

Chroma—0 or 1
Texture—silty clay loam or silty clay

Bg horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 to 5 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay or silty clay loam

Bkg horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 to 7 (2 to 5 moist)
Chroma—0 to 2
Texture—silty clay; silt loam or silty clay loam in some pedons

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 7 (3 to 5 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam; clay loam or silty clay in some pedons

Parnell Series

Depth to bedrock: Very deep
Drainage class: Very poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Parnell silty clay loam, 0 to 1 percent slopes, 1,410 feet east and 710 feet south of the northwest corner of sec. 17, T. 112 N., R. 52 W.; USGS Lake Poinsett, South Dakota, topographic quadrangle; lat. 44 degrees 30 minutes 44 seconds N. and long. 97 degrees 6 minutes 23 seconds W.

A1—0 to 10 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium granular structure; slightly hard, friable, slightly sticky and plastic; common very fine and fine roots; few very fine pores; slightly acid; clear smooth boundary.

A2—10 to 17 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak medium granular; hard, friable, slightly sticky and plastic; few very fine roots; few very fine pores; few fine prominent dark yellowish brown (10YR 4/6) redoximorphic concentrations; slightly acid; clear wavy boundary.

Btg1—17 to 27 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; few very fine roots; few very fine pores; common faint continuous black (10YR 2/1) clay films on vertical and horizontal faces of peds; few fine prominent dark yellowish brown (10YR 4/6) redoximorphic concentrations; slightly acid; gradual wavy boundary.

Btg2—27 to 45 inches; olive gray (5Y 4/2) silty clay, dark olive gray (5Y 3/2) moist; strong medium prismatic structure parting to moderate medium subangular blocky; extremely hard, firm, sticky and plastic; few very fine pores; common distinct discontinuous black (10YR 2/1) clay films on vertical and horizontal faces of peds; few medium prominent dark yellowish brown (10YR 4/6) redoximorphic concentrations; neutral; gradual wavy boundary.

Cg1—45 to 54 inches; light olive gray (5Y 6/2) silty clay, olive gray (5Y 5/2) moist; massive; extremely hard, firm, sticky and plastic; common medium prominent dark yellowish brown (10YR 4/6) redoximorphic concentrations; neutral; gradual wavy boundary.

Cg2—54 to 60 inches; light gray (5Y 7/2) silty clay loam, light olive gray (5Y 6/2) moist; massive; extremely hard, firm, slightly sticky and plastic; common medium prominent dark yellowish brown (10YR 4/6) redoximorphic concentrations; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 65 inches
Depth to carbonates: More than 35 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam; silt loam, loam, or silty clay in some pedons

Btg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 or 2
Texture—silty clay; silty clay loam, clay loam, or clay in some pedons

Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 7 (3 to 6 moist)

Chroma—1 or 2
Texture—silty clay or silty clay loam; loam, clay loam, or clay in some pedons

Poinsett Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Till plains and moraines
Parent material: Silty glacial till
Slope: 0 to 15 percent

Typical Pedon

Poinsett silty clay loam (fig. 22), in an area of Poinsett-Waubay silty clay loams, 1 to 6 percent slopes, 1,510 feet south and 150 feet west of the northeast corner of sec. 31, T. 112 N., R. 52 W.; USGS Arlington NE, South Dakota, topographic quadrangle; lat. 44 degrees 27 minutes 57 seconds N. and long. 97 degrees 6 minutes 31 seconds W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate medium granular; hard, friable, moderately sticky and moderately plastic; common very fine roots; few very fine pores; slightly acid; abrupt smooth boundary.

Bw1—8 to 13 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, moderately sticky and moderately plastic; few very fine roots; few very fine pores; neutral; gradual wavy boundary.

Bw2—13 to 23 inches; brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, moderately sticky and moderately plastic; few very fine roots; common very fine pores; neutral; clear wavy boundary.

Bk1—23 to 35 inches; light brownish gray (2.5Y 6/2) silty clay loam, olive brown (2.5Y 4/3) moist; common fine prominent strong brown (7.5YR 5/8) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, moderately sticky and moderately plastic; common very fine pores; common fine and medium accumulations of calcium carbonate; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—35 to 46 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; common fine prominent yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; hard, friable, moderately sticky and moderately plastic; few very fine pores; common fine accumulations of calcium carbonate; violently effervescent; moderately alkaline; clear wavy boundary.

Bk3—46 to 62 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; common medium and coarse prominent yellowish red (5YR 4/6) and yellowish brown (10YR 5/6) and few fine faint light brownish gray (2.5Y 6/2) mottles; weak coarse subangular blocky structure; hard, friable, moderately sticky and moderately plastic; few very fine pores; common fine accumulations of carbonate; strongly effervescent; moderately alkaline; clear wavy boundary.

2C1—62 to 68 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; common medium and coarse prominent yellowish brown (10YR 5/6) and few fine distinct light brownish gray (2.5Y 6/2) mottles; massive; hard, firm, slightly sticky and slightly plastic; few very fine pores; few fine prominent very dark gray (10YR 3/1) redoximorphic concretions; 3 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C2—68 to 80 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; few fine and medium prominent yellowish brown (10YR 5/6), few fine prominent very dark gray (10YR 3/1), and common fine distinct light brownish gray (2.5Y 6/2) mottles; massive; hard, firm, slightly sticky and slightly plastic; few very fine pores; 3 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 14 to 30 inches
Depth to contrasting parent material: More than 40 inches to loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a C horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silt clay loam; silt loam or clay loam in some pedons

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (2 to 4 moist)
Chroma—1 to 4
Texture—silty clay loam; silt loam or clay loam in some pedons

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silty clay loam or silt loam

2C horizon:
Hue—2.5Y or 5Y
Value—6 or 7 (5 or 6 moist)
Chroma—2 to 4
Texture—clay loam

Rauville Series

Depth to bedrock: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow
Landform: Flood plains
Parent material: Silty alluvium
Slope: 0 to 1 percent

Typical Pedon

Rauville silty clay loam, 0 to 1 percent slopes, 2,230 feet west and 190 feet north of the southeast corner of sec. 4, T. 112 N., R. 51 W.; USGS Estelline, South Dakota, topographic quadrangle; lat. 44 degrees 31 minutes 44 seconds N. and long. 96 degrees 57 minutes 24 seconds W.

A1—0 to 10 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate medium granular structure parting to weak fine and medium subangular blocky; hard, friable, slightly sticky and slightly plastic; many very fine and common fine and medium roots; strongly effervescent; slightly alkaline; clear wavy boundary.

A2—10 to 24 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine roots; few medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly effervescent; slightly alkaline; gradual wavy boundary.

Cg1—24 to 28 inches; olive gray (5Y 5/2) silty clay loam, black (5Y 2.5/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly effervescent; slightly alkaline; gradual wavy boundary.

Cg2—28 to 48 inches; light olive gray (5Y 6/2) silty clay loam, olive gray (5Y 5/2) moist; massive; hard, friable, slightly sticky and slightly plastic; many medium and coarse prominent yellowish brown (10YR 5/8) redoximorphic concentrations; slightly effervescent; slightly alkaline; clear wavy boundary.

2Cg3—48 to 60 inches; grayish brown (2.5Y 5/2) coarse sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; neutral.

Range in Characteristics

Thickness of the mollic epipedon: More than 24 inches
Carbonates: At the surface
Depth to contrasting parent material: More than 40 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 to 5 (2 or 3 moist)
Chroma—0 to 2
Texture—silty clay loam or silt loam

Cg horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—5 to 8 (2 to 6 moist)
Chroma—0 to 2
Texture—silty clay loam or silt loam; silty clay, clay loam, or loam in some pedons

2C horizon:
Hue—2.5Y or 5Y
Value—5 to 8 (4 to 6 moist)
Chroma—1 to 4
Texture—coarse sand; gravelly sand, gravelly sandy loam, sandy loam, silt loam, loam, fine sandy loam, or clay loam in some pedons

Renshaw Series

Depth to bedrock: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Outwash plains and moraines
Parent material: Loamy alluvium over outwash
Slope: 2 to 25 percent

Typical Pedon

Renshaw loam, in an area of Sioux-Renshaw complex, 9 to 15 percent slopes, 2,590 feet south and 885 feet east of the northwest corner of sec. 7, T. 111 N., R. 51 W.; USGS Arlington NE, South Dakota, topographic quadrangle; lat. 44 degrees 26 minutes 4 seconds N. and long. 97 degrees 0 minutes 14 seconds W.

A—0 to 7 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; hard, friable, slightly sticky; many very fine and fine roots; common very fine pores; 3 percent gravel; neutral; abrupt smooth boundary.

Bw1—7 to 12 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine pores; 2 percent gravel; neutral; clear smooth boundary.

Bw2—12 to 18 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; 3 percent gravel; neutral; clear smooth boundary.

2C1—18 to 24 inches; brown (10YR 5/3) gravelly loamy sand, brown (10YR 4/3) moist; single grain; loose; common very fine roots; few discontinuous carbonate coats on sand and gravel; 28 percent gravel; strongly effervescent; slightly alkaline; gradual wavy boundary.

2C2—24 to 60 inches; brown (10YR 5/3) very gravelly loamy sand, brown (10YR 4/3) moist; single grain; loose; few discontinuous carbonate coats on sand and gravel; 45 percent gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 14 to 20 inches
Depth to contrasting parent material: 14 to 20 inches to gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—loam; gravelly loam or sandy loam in some pedons

Bw horizon:
Hue—10YR
Value—3 to 5 (3 or 4 moist)
Chroma—1 to 4
Texture—loam; sandy loam, sandy clay loam, or gravelly loam in some pedons

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—gravelly loamy sand or very gravelly loamy sand; gravelly sand, very gravelly sand, gravelly coarse sand, very gravelly coarse sand, or coarse sand in some pedons

Renwash Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Flood plains
Parent material: Loamy alluvium over outwash
Slope: 0 to 2 percent

Typical Pedon

Renwash loam, 0 to 2 percent slopes, 750 feet west and 110 feet south of the northeast corner of sec. 24, T. 112 N., R. 51 W.; USGS Bruce, South Dakota, topographic quadrangle; lat. 44 degrees 29 minutes 57 seconds N. and long. 96 degrees 53 minutes 26 seconds W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine pores; 1 percent gravel; neutral; abrupt smooth boundary.

Bw1—7 to 12 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; 1 percent gravel; neutral; clear wavy boundary.

Bw2—12 to 17 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; 1 percent gravel; neutral; abrupt wavy boundary.

2C1—17 to 22 inches; brown (10YR 5/3) gravelly

loamy sand, brown (10YR 4/3) moist; single grain; loose; few carbonate coats on undersides of gravel; 20 percent gravel; very slightly effervescent; neutral; abrupt wavy boundary.

2C2—22 to 36 inches; grayish brown (10YR 5/2) gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose; common carbonate coats on undersides of gravel; 30 percent gravel; slightly effervescent; slightly alkaline; clear wavy boundary.

2C3—36 to 80 inches; grayish brown (10YR 5/2) very gravelly sand, dark grayish brown (10YR 4/2) moist; single grain; loose; few carbonate coats on undersides of gravel; 50 percent gravel; slightly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 15 inches
Depth to carbonates: 14 to 20 inches
Depth to contrasting parent material: 14 to 20 inches to gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam; gravelly loam or sandy loam in some pedons

Bw horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—3 to 5 (3 or 4 moist)
Chroma—1 to 4
Texture—loam or sandy loam

2C horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—gravelly sand, sand, coarse sand, very gravelly sand, gravelly loamy sand, very gravelly loamy sand, or very gravelly coarse sand

Singsaas Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains and moraines
Parent material: Silty glacial till over loamy glacial till
Slope: 0 to 9 percent

Typical Pedon

Singsaas silty clay loam, in an area of Singsaas-Waubay silty clay loams, 1 to 6 percent slopes, 1,460 feet south and 250 feet west of the northeast corner of sec. 9, T. 112 N., R. 47 W.; USGS Hendricks, Minnesota/South Dakota, topographic quadrangle; lat. 44 degrees 31 minutes 27 seconds N. and long. 96 degrees 27 minutes 54 seconds W.

Ap—0 to 9 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine pores; few wormcasts; neutral; abrupt smooth boundary.

AB—9 to 13 inches; dark grayish brown (10YR 4/2) and brown (10YR 5/3) silty clay loam, black (10YR 2/1) and dark brown (10YR 3/3) moist; moderate medium subangular blocky structure parting to moderate very fine and fine subangular blocky; hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; many fine pores; 60 percent wormcasts and wormholes; neutral; clear wavy boundary.

Bw—13 to 19 inches; brown (10YR 5/3) and dark grayish brown (10YR 4/2) silty clay loam, brown (10YR 4/3) and very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; few very fine roots; many fine pores; 30 percent wormcasts and wormholes; few calcareous wormcasts; neutral; clear wavy boundary.

2Bk1—19 to 32 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine roots; many fine pores; few wormcasts and wormholes; common fine accumulations of calcium carbonate; 4 percent pebbles; violently effervescent; moderately alkaline; gradual wavy boundary.

2Bk2—32 to 41 inches; light yellowish brown (2.5Y 6/4) loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine pores; few wormholes; common fine accumulations of calcium carbonate; common fine and medium distinct yellowish brown (10YR 5/6) redoximorphic concentrations and gray (10YR 5/1)

redoximorphic depletions; 3 percent pebbles; violently effervescent; moderately alkaline; gradual wavy boundary.

2C1—41 to 52 inches; light brownish gray (2.5Y 6/2) loam, olive brown (2.5Y 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine pores; few wormholes; few fine accumulations of calcium carbonate; few fine prominent red (2.5YR 4/6) and common fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; common fine and medium distinct grayish brown (2.5Y 5/2) redoximorphic depletions; 4 percent pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C2—52 to 80 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine pores; few fine prominent red (2.5YR 4/6) and common fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations and common fine and medium distinct light brownish gray (2.5Y 6/2) redoximorphic depletions; 4 percent pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 12 to 30 inches
Depth to carbonates: 15 to 30 inches
Depth to contrasting parent material: 10 to 20 inches to loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—4 or 5 (2 or 3 moist)
Chroma—1
Texture—silty clay loam; loam or silt loam in some pedons

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (2 to 5 moist)
Chroma—1 to 4
Texture—silty clay loam; silt loam, loam, or clay loam in some pedons

2Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

2C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

Sioux Series

Depth to bedrock: Very deep
Drainage class: Excessively drained
Permeability: Very rapid
Landform: Outwash plains and moraines
Parent material: Loamy alluvium over outwash
Slope: 2 to 40 percent

Typical Pedon

Sioux gravelly loam (fig. 23), in an area of Estelline-Sioux complex, 2 to 6 percent slopes, 2,595 feet south and 405 feet east of the northwest corner of sec. 7, T. 111 N., R. 51 W.; USGS Arlington NE, South Dakota, topographic quadrangle; lat. 44 degrees 26 minutes 4 seconds N. and long. 97 degrees 0 minutes 20 seconds W.

Ap—0 to 7 inches; dark gray (10YR 4/1) gravelly loam, very dark gray (10YR 3/1) moist; weak medium granular structure; soft, friable; common fine roots; few discontinuous carbonate coats on gravel; 25 percent gravel; strongly effervescent; moderately alkaline; abrupt smooth boundary.

AC—7 to 10 inches; grayish brown (10YR 5/2) gravelly loam, dark grayish brown (10YR 4/2) moist; weak medium granular structure; soft, friable; few very fine roots; common discontinuous carbonate coats on gravel; 35 percent gravel; violently effervescent; moderately alkaline; abrupt smooth boundary.

C—10 to 60 inches; pale brown (10YR 6/3) very gravelly sand, brown (10YR 4/3) moist; single grain; loose; common discontinuous carbonate coats on sand and gravel; 40 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 14 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting parent material: 6 to 14 inches to gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1
Texture—gravelly loam; gravelly sandy loam, sandy loam, loam, loamy sand, loamy coarse

sand, gravelly loamy sand, or cobbly sandy loam in some pedons

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—very gravelly sand; gravelly sand, gravelly loamy sand, very gravelly loamy sand, extremely gravelly sand, very gravelly coarse sand, or extremely gravelly coarse sand in some pedons

Southam Series

Depth to bedrock: Very deep
Drainage class: Very poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Southam silty clay loam, 0 to 1 percent slopes, 90 feet west and 20 feet north of the southeast corner of sec. 7, T. 110 N., R. 51 W.; USGS Volga, South Dakota, topographic quadrangle; lat. 44 degrees 20 minutes 27 seconds N. and long. 96 degrees 59 minutes 24 seconds W.

Ag1—0 to 12 inches; dark gray (2.5Y 4/1) silty clay loam, black (2.5Y 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; hard, firm, sticky and plastic; few fine and medium snail-shell fragments; slightly effervescent; neutral; clear smooth boundary.

Ag2—12 to 20 inches; dark gray (2.5Y 4/1) silty clay, very dark gray (2.5Y 3/1) moist; weak fine subangular blocky structure; very hard, firm, sticky and plastic; few fine and medium snail-shell fragments; few fine prominent dark yellowish brown (10YR 4/4) redoximorphic concentrations; slightly effervescent; slightly alkaline; gradual smooth boundary.

Ag3—20 to 38 inches; dark gray (2.5Y 4/1) silty clay, very dark gray (2.5Y 3/1) moist; weak fine subangular blocky structure; very hard, very firm, very sticky and very plastic; few fine and medium snail-shell fragments; few fine prominent dark yellowish brown (10YR 4/4) redoximorphic concentrations; strongly effervescent; slightly alkaline; clear smooth boundary.

Cg1—38 to 55 inches; gray (2.5Y 5/1) silty clay, very dark gray (2.5Y 3/1) moist; massive; extremely hard, very firm, very sticky and very plastic; few fine dark yellowish brown (10YR 4/6) iron-manganese concretions; few fine and medium snail-shell fragments; few fine prominent dark yellowish brown (10YR 4/4) redoximorphic concentrations; strongly effervescent; slightly alkaline; gradual smooth boundary.

Cg2—55 to 80 inches; gray (2.5Y 6/1) silty clay, very dark gray (2.5Y 3/1) moist; massive; extremely hard, very firm, very sticky and very plastic; few fine and medium snail-shell fragments; common fine prominent dark yellowish brown (10YR 4/4) redoximorphic concentrations; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 60 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): 25 to 40 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 to 5 (2 to 3 moist)
Chroma—0 to 2
Texture—silty clay loam or silty clay; clay loam, silt loam, or clay in some pedons

Cg horizon:
Hue—2.5Y, 5Y, 5GY, or N
Value—4 to 8 (3 to 7 moist)
Chroma—0 to 2
Texture—silty clay; silty clay loam, clay loam, or clay in some pedons

Spottswood Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Flood plains
Parent material: Loamy alluvium over outwash
Slope: 0 to 2 percent

Typical Pedon

Spottswood loam, 0 to 2 percent slopes, 950 feet east and 300 feet north of the southwest corner of sec. 19, T. 110 N., R. 50 W.; USGS Volga, South Dakota, topographic quadrangle; lat. 44 degrees 18 minutes 48 seconds N. and long. 96 degrees 53 minutes 3 seconds W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) loam,

black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate fine and medium granular; hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine pores; common fine wormcasts; 2 percent subrounded gravel; neutral; abrupt smooth boundary.

Bw1—10 to 17 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine pores; common fine wormcasts; 1 percent subrounded gravel; neutral; gradual wavy boundary.

Bw2—17 to 22 inches; light olive brown (2.5Y 5/3) sandy loam, olive brown (2.5Y 4/3) moist; weak coarse prismatic structure parting to moderate coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; common discontinuous black (10YR 2/1) organic coats on faces of peds; 11 percent subrounded gravel; slightly alkaline; clear wavy boundary.

BC—22 to 26 inches; light olive brown (2.5Y 5/3) sandy loam, olive brown (2.5Y 4/3) moist; weak coarse subangular blocky structure; slightly hard, very friable; few fine roots; common fine pores; few discontinuous black (10YR 2/1) organic coats on faces of peds; common fine prominent yellowish brown (10YR 5/6 and 5/4) redoximorphic concentrations; very slightly effervescent; 13 percent subrounded gravel; slightly alkaline; abrupt smooth boundary.

2C—26 to 80 inches; light brownish gray (2.5Y 6/2) gravelly sand, grayish brown (2.5Y 5/2) moist; single grain; loose; few discontinuous carbonate coats on sand and gravel; few fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; 27 percent subrounded gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 40 inches
Depth to carbonates: More than 16 inches
Depth to contrasting parent material: 20 to 40 inches to gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1.5 or less
Texture—loam; silt loam, fine sandy loam, sandy loam, or clay loam in some pedons

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 or 2
Texture—clay loam or loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—gravelly sand; loamy sand, sand, gravelly loamy sand, or stratified sand and gravel in some pedons

Strayhoss Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Till plains and outwash plains
Parent material: Loamy eolian material over sandy eolian material
Slope: 0 to 6 percent

Typical Pedon

Strayhoss loam (fig. 24), 2 to 6 percent slopes, 2,230 feet west and 400 feet south of the northeast corner of sec. 3, T. 112 N., R. 51 W.; USGS Estelline, South Dakota, topographic quadrangle; lat. 44 degrees 32 minutes 33 seconds N. and long. 96 degrees 56 minutes 12 seconds W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loam, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; few very fine pores; moderately acid; abrupt smooth boundary.

Bw1—8 to 15 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine roots; common very fine and few fine pores; neutral; clear wavy boundary.

Bw2—15 to 24 inches; yellowish brown (10YR 5/4) silt loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine roots; common very fine and few fine pores; neutral; clear smooth boundary.

Bk—24 to 30 inches; light yellowish brown (2.5Y 6/3) silt loam, light olive brown (2.5Y 5/3) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine pores; common fine soft masses of carbonate; violently effervescent; moderately alkaline; clear smooth boundary.

2C1—30 to 42 inches; light yellowish brown (2.5Y 6/3) loamy fine sand, light olive brown (2.5Y 5/3) moist; single grain; soft; loose; few fine soft masses of carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C2—42 to 57 inches; light yellowish brown (2.5Y 6/3) loamy fine sand, light olive brown (2.5Y 5/3) moist; single grain; soft; loose; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C3—57 to 80 inches; pale yellow (2.5Y 7/4) loamy very fine sand stratified with silt loam, light olive brown (2.5Y 5/4) moist; common medium distinct yellowish brown (10YR 5/8) mottles; massive; slightly hard, friable; few very fine pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 16 inches
Depth to carbonates: 22 to 36 inches
Depth to contrasting parent material: 20 to 40 inches to sandy material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a 2Bk horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam; silt loam or silty clay loam in some pedons

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (3 or 4 moist)
Chroma—2 to 4
Texture—loam or silt loam; clay loam or silty clay loam in some pedons

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (3 to 5 moist)
Chroma—2 to 4
Texture—silt loam, clay loam, or silty clay loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loamy fine sand, loamy very fine sand, or fine sand with thin strata of silt loam, loam, or sandy loam in the lower part

Svea Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Local loamy alluvium
Slope: 0 to 2 percent

Typical Pedon

Svea loam, in an area of Doland-Svea loams, 0 to 2 percent slopes, 1,200 feet east and 40 feet south of the northwest corner of sec. 8, T. 111 N., R. 50 W.; USGS Brookings NE, South Dakota, topographic quadrangle; lat. 44 degrees 26 minutes 30 seconds N. and long. 96 degrees 51 minutes 52 seconds W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine pores; neutral; gradual smooth boundary.

Bw1—10 to 18 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; weak coarse prismatic structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine pores; neutral; gradual smooth boundary.

Bw2—18 to 28 inches; yellowish brown (10YR 5/4) loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; soft, friable, slightly sticky and slightly plastic; few fine roots; few very fine pores; neutral; clear smooth boundary.

Bk—28 to 36 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few very fine pores; common fine and medium soft masses of carbonate; 3 percent gravel; violently effervescent; moderately alkaline; gradual wavy boundary.

C—36 to 80 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine pores; few fine soft masses of carbonate; few fine distinct grayish brown (2.5Y

5/2) redoximorphic depletions; 3 percent gravel; violently effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: More than 16 inches
Depth to carbonates: 11 to 44 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR, 2.5Y, or N
Value—3 to 5 (2 or 3 moist)
Chroma—0 or 1
Texture—loam; silt loam or clay loam in some pedons

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 4
Texture—loam; silt loam or clay loam in some pedons

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 8 (4 to 6 moist)
Chroma—1 to 4
Texture—clay loam or loam

C horizon:
Hue—2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 to 4
Texture—clay loam or loam

Swenoda Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderately rapid in the loamy sediments and moderately slow in the underlying material
Landform: Till plains
Parent material: Loamy glaciofluvial sediments over loamy glacial till or glaciolacustrine sediments
Slope: 0 to 4 percent

Typical Pedon

Swenoda sandy loam (fig. 25), in an area of Lanona-Swenoda sandy loams, 2 to 6 percent slopes, 350 feet south and 160 feet west of the northeast corner of sec. 9, T. 112 N., R. 50 W.; USGS Estelline SE, South Dakota, topographic quadrangle; lat. 44 degrees 31 minutes 42 seconds N. and long. 96 degrees 49 minutes 40 seconds W.

Ap—0 to 8 inches; dark gray (10YR 4/1) sandy loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; common fine roots; few very fine pores; slightly acid; abrupt smooth boundary.

Bw1—8 to 18 inches; brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; weak medium and coarse prismatic structure parting to weak medium and coarse subangular blocky; soft, very friable; few very fine roots; few very fine pores; neutral; clear wavy boundary.

Bw2—18 to 29 inches; light olive brown (2.5Y 5/3) fine sandy loam, olive brown (2.5Y 4/3) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; soft, very friable; few very fine pores; neutral; abrupt wavy boundary.

BC—29 to 34 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; moderate coarse prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine pores; neutral; abrupt wavy boundary.

2Bk—34 to 50 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine soft masses of carbonate; few fine prominent yellowish brown (10YR 5/8) iron masses; 2 percent gravel; violently effervescent; moderately alkaline; gradual wavy boundary.

2C—50 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations; 3 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 30 inches
Depth to carbonates: 20 to 40 inches
Depth to contrasting parent material: 20 to 40 inches to glacial till or glaciolacustrine sediments
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—2 to 4 (2 or 3 moist)
Chroma—1 or 2
Texture—sandy loam; fine sandy loam, loam, or loamy fine sand in some pedons

Bw horizon:
Hue—10YR or 2.5Y

Value—3 to 6 (2 to 4 moist)
Chroma—1 to 4
Texture—fine sandy loam; sandy loam, loamy sand, or loamy fine sand in some pedons

2Bk horizon:
Hue—2.5Y or 5Y
Value—6 to 8 (4 to 6 moist)
Chroma—2 to 6
Texture—clay loam; loam, silt loam, or silty clay loam in some pedons

2C horizon:
Hue—10YR or 2.5Y
Value—6 to 8 (4 to 6 moist)
Chroma—2 to 6
Texture—clay loam; loam, silt loam, or silty clay loam in some pedons

Tonka Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Tonka silty clay loam (fig. 26), 0 to 1 percent slopes, 1,030 feet north and 185 feet east of the southwest corner of sec. 6, T. 112 N., R. 51 W.; USGS Lake Poinsett, South Dakota, topographic quadrangle; lat. 44 degrees 31 minutes 50 seconds N. and long. 97 degrees 0 minutes 23 seconds W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; few very fine pores; neutral; abrupt smooth boundary.

A—8 to 13 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine pores; neutral; clear smooth boundary.

E—13 to 24 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; weak thin platy structure; slightly hard, very friable; few very fine roots; few very fine pores; neutral; gradual wavy boundary.

Bt1—24 to 30 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; few very fine roots; few very fine pores; few distinct discontinuous black (10YR 2/1) clay films on vertical and horizontal faces of peds; common fine prominent dark yellowish brown (10YR 4/6) redoximorphic concentrations; neutral; gradual wavy boundary.

Bt2—30 to 40 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; few very fine roots; few very fine pores; few distinct discontinuous very dark gray (10YR 3/1) clay films on vertical and horizontal faces of peds; common fine prominent dark yellowish brown (10YR 4/6) redoximorphic concentrations; neutral; gradual wavy boundary.

Cg1—40 to 49 inches; light gray (2.5Y 7/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, sticky and plastic; few very fine pores; many medium prominent dark yellowish brown (10YR 4/6) redoximorphic concentrations; neutral; gradual wavy boundary.

2Cg2—49 to 60 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; hard, firm, sticky and plastic; many medium prominent dark yellowish brown (10YR 4/6) redoximorphic concentrations; 3 percent gravel; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 50 inches
Depth to carbonates: More than 20 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR or N
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam; silt loam, loam, or clay loam in some pedons

E horizon:
Hue—10YR, 2.5Y, or N
Value—5 to 7 (3 to 5 moist)
Chroma—0 to 2
Texture—silty clay loam; loam, silt loam, or very fine sandy loam in some pedons

Bt horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 5 (2 to 4 moist)

Chroma—1 or 2
Texture—clay loam, silty clay loam, silty clay, or clay

Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 7 (2 to 6 moist)
Chroma—1 to 6
Texture—silty clay loam or silty clay; clay, silt loam, or sandy clay loam in some pedons

Trent Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Till plains
Parent material: Silty glacial till
Slope: 0 to 2 percent

Typical Pedon

Trent silty clay loam, in an area of Moody-Trent silty clay loams, 0 to 2 percent slopes, 1,567 feet south and 67 feet west of the northeast corner of sec. 27, T. 106 N., R. 48 W., in Moody County, South Dakota; USGS Dell Rapids NE, South Dakota, topographic quadrangle; lat. 43 degrees 57 minutes 35 seconds N. and long. 96 degrees 34 minutes 0 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few very fine pores; slightly acid; abrupt smooth boundary.

A—8 to 13 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few very fine pores; many wormcasts; slightly acid; clear wavy boundary.

Bw1—13 to 20 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine pores; many wormcasts; slightly acid; clear wavy boundary.

Bw2—20 to 25 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; black (10YR 2/1) coats on faces of peds; common wormcasts; neutral; gradual wavy boundary.

Bw3—25 to 31 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; few wormcasts; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations and very dark brown (10YR 2/2) redoximorphic depletions; neutral; gradual wavy boundary.

Bw4—31 to 35 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; common fine prominent light olive brown (2.5Y 5/6) redoximorphic concentrations and black (N 2/0) redoximorphic depletions; neutral; gradual wavy boundary.

Bk—35 to 46 inches; pale yellow (2.5Y 7/4) silty clay loam, light yellowish brown (2.5Y 6/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; common fine soft masses of carbonate; common fine prominent light olive brown (2.5Y 5/6) redoximorphic concentrations and gray (5Y 5/1) and black (N 2/0) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—46 to 60 inches; pale yellow (2.5Y 7/4) silt loam, light yellowish brown (2.5Y 6/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine soft masses of carbonate; common fine distinct light olive brown (2.5Y 5/6) redoximorphic concentrations and common fine prominent gray (5Y 6/1) and black (N 2/0) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 40 inches
Depth to carbonates: 30 to 60 inches
Depth to contrasting parent material: More than 40 inches to loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 6 (2 to 5 moist)
Chroma—1 to 4
Texture—silty clay loam or silt loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silty clay loam or silt loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silt loam or silty clay loam

Venagro Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Loamy eolian material over glacial till
Slope: 0 to 6 percent

Typical Pedon

Venagro loam, in an area of Venagro-Svea loams, 1 to 6 percent slopes, 1,450 feet west and 200 feet south of the northeast corner of sec. 17, T. 111 N., R. 50 W.; USGS Brookings NE, South Dakota, topographic quadrangle; lat. 44 degrees 25 minutes 37 seconds N. and long. 96 degrees 51 minutes 11 seconds W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and plastic; common fine roots; few fine pores; moderately acid; abrupt smooth boundary.

Bw1—9 to 15 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and plastic; few very fine roots; few fine pores; slightly alkaline; clear smooth boundary.

Bw2—15 to 28 inches; brown (10YR 5/3) silt loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few fine pores; slightly alkaline; clear smooth boundary.

Bk1—28 to 48 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine pores; common medium accumulations of calcium carbonate; 1 percent gravel; violently effervescent; slightly alkaline; gradual wavy boundary.

2Bk2—48 to 60 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common very fine and fine pores; few fine accumulations of calcium carbonate; common medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations and few medium prominent light gray (10YR 7/1) redoximorphic depletions; 7 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C—60 to 80 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and plastic; few fine irregular iron-manganese concretions and few fine irregular salt masses; few medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; 2 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 20 to 60 inches
Depth to contrasting parent material: More than 40 inches to sandy material or loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1.5 or less
Texture—loam; silt loam, clay loam, or silty clay loam in some pedons

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (3 to 5 moist)
Chroma—2 to 4
Texture—silt loam; clay loam, loam, or silty clay loam in some pedons

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or silt loam

2Bk and 2C horizons:
Hue—10YR or 2.5Y
Value—5 to 8 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

Vienna Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains and moraines
Parent material: Loess over loamy glacial till
Slope: 0 to 9 percent

Typical Pedon

Vienna silt loam, in an area of Vienna-Brookings complex, 1 to 6 percent slopes, 2,370 feet east and 366 feet south of the northwest corner of sec. 12, T. 112 N., R. 49 W.; USGS Toronto, South Dakota, topographic quadrangle; lat. 44 degrees 31 minutes 39 seconds N. and long. 96 degrees 39 minutes 24 seconds W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, black (10YR 2/1) moist; weak fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; few very fine pores; neutral; abrupt smooth boundary.

Bw—9 to 17 inches; light olive brown (2.5Y 5/3) silt loam, olive brown (2.5Y 4/3) moist; moderate medium and coarse prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; few very fine pores; neutral; abrupt wavy boundary.

2Bk—17 to 32 inches; light yellowish brown (2.5Y 6/3) loam, light olive brown (2.5Y 5/4) moist; weak medium and coarse prismatic structure parting to weak fine and medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine roots; few very fine pores; common fine soft masses of carbonate; 2 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.

2C1—32 to 41 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine pores; common fine and medium soft masses of carbonate; 2 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C2—41 to 57 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; few fine and medium prominent strong brown (7.5YR 5/6) mottles; massive; hard, firm, slightly sticky and slightly plastic; few fine soft masses of carbonate; 3 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C3—57 to 80 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; common fine and medium prominent strong brown (7.5YR 5/6) mottles; massive; hard, firm, slightly sticky and slightly plastic; 3 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 16 inches
Depth to carbonates: 14 to 30 inches
Depth to contrasting parent material: 10 to 20 inches to loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silt loam; silty clay loam or loam in some pedons

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 4
Texture—silt loam; silty clay loam, clay loam, or loam in some pedons

2Bk horizon:
Hue—10YR or 2.5Y
Value—6 or 7 (4 or 5 moist)
Chroma—3 or 4
Texture—loam or clay loam

2C horizon:
Hue—10YR or 2.5Y
Value—6 or 7 (5 or 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

Wakonda Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Till plains
Parent material: Silty glacial till
Slope: 0 to 2 percent

Typical Pedon

Wakonda silty clay loam, in an area of Wentworth-Chancellor-Wakonda silty clay loams, 0 to 2 percent slopes, 1,920 feet north and 1,090 feet west of the southeast corner of sec. 3, T. 108 N., R. 50 W., in Moody County, South Dakota; USGS Medary, South Dakota, topographic quadrangle; lat. 44 degrees 11 minutes 12 seconds N. and long. 96 degrees 48 minutes 48 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine pores; 9 percent calcium carbonate; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bk1—8 to 13 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine pores; few fine soft masses of carbonate and many wormcasts; 15 percent calcium carbonate; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—13 to 24 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine pores; common fine soft masses of carbonate and common wormcasts; 23 percent calcium carbonate; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—24 to 35 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; common fine soft masses of carbonate; 21 percent calcium carbonate; yellowish brown (10YR 5/6) redoximorphic concentrations and few fine prominent black (10YR 2/1) redoximorphic depletions; violently effervescent; moderately alkaline; gradual wavy boundary.

C—35 to 60 inches; pale yellow (2.5Y 7/4) silty clay loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine pores; 13 percent calcium carbonate; few fine salt masses; yellowish brown (10YR 5/6) redoximorphic concentrations and common fine prominent gray (10YR 6/1) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 0 to 6 inches
Depth to contrasting parent material: More than 40 inches to loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam; loam or silt loam in some pedons

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (3 to 5 moist)
Chroma—2 to 4
Texture—silty clay loam or silt loam

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—silty clay loam or silt loam; sandy loam, loam, or clay loam in some pedons

Waubay Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Till plains
Parent material: Silty glacial till
Slope: 0 to 6 percent

Typical Pedon

Waubay silty clay loam, in an area of Poinsett-Buse-Waubay complex, 1 to 6 percent slopes, 260 feet east and 120 feet south of the northwest corner of sec. 29, T. 112 N., R. 51 W.; USGS Bruce, South Dakota, topographic quadrangle; lat. 44 degrees 29 minutes 3 seconds N. and long. 96 degrees 59 minutes 12 seconds W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few very fine pores; neutral; abrupt smooth boundary.

A—7 to 12 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few very fine pores; neutral; clear wavy boundary.

Bw1—12 to 18 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium and coarse prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine pores; slightly alkaline; clear wavy boundary.

Bw2—18 to 25 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium and coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; slightly alkaline; clear wavy boundary.

Bk1—25 to 32 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; common fine soft masses of carbonate; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—32 to 41 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common fine soft masses of carbonate; violently effervescent; moderately alkaline; gradual wavy boundary.

C—41 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 35 inches
Depth to carbonates: 20 to 36 inches
Depth to contrasting parent material: More than 40 inches to loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (3 or 4 moist)
Chroma—1 to 3
Texture—silt loam or silty clay loam

Bk horizon:
Hue—2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 to 4
Texture—silt loam or silty clay loam

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silt loam, silty clay loam, or loam; stratified very fine sandy loam, fine sand, or clay below a depth of 36 inches in some pedons

Wentworth Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Till plains
Parent material: Silty glacial till
Slope: 0 to 6 percent

Typical Pedon

Wentworth silty clay loam, in an area of Wentworth-Egan silty clay loams, 2 to 6 percent slopes, 2,570 feet west and 230 feet south of the northeast corner of sec. 3, T. 108 N., R. 50 W., in Moody County, South Dakota; USGS Medary, South Dakota, topographic quadrangle; lat. 44 degrees 11 minutes 42 seconds N. and long. 96 degrees 49 minutes 8 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine pores; neutral; abrupt smooth boundary.

Bw1—8 to 18 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine pores; common wormcasts; neutral; clear wavy boundary.

Bw2—18 to 27 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; weak medium

prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; few wormcasts; neutral; clear wavy boundary.

Bk1—27 to 37 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; common fine soft masses of carbonate; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—37 to 48 inches; pale yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; common fine prominent gray (10YR 6/1) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine pores; common fine soft masses of carbonate; moderately alkaline; clear smooth boundary.

C—48 to 60 inches; pale yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; common fine prominent yellowish brown (10YR 5/6) and gray (10YR 6/1) mottles; massive; hard, friable, slightly sticky and slightly plastic; few very fine pores; few fine soft masses of carbonate; violently effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 20 inches
Depth to carbonates: 20 to 36 inches
Depth to contrasting parent material: More than 40 inches to loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (2 to 4 moist)
Chroma—2 to 4
Texture—silty clay loam or silt loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silt loam or silty clay loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silt loam or silty clay loam; loam or sandy loam in some pedons

Worthing Series

Depth to bedrock: Very deep
Drainage class: Very poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Worthing silty clay loam, 0 to 1 percent slopes, 555 feet south and 280 feet east of the northwest corner of sec. 19, T. 108 N., R. 49 W., in Moody County, South Dakota; USGS Medary, South Dakota, topographic quadrangle; lat. 44 degrees 9 minutes 3 seconds N. and long. 96 degrees 46 minutes 2 seconds W.

Ap—0 to 10 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine and medium granular structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine pores; moderately acid; abrupt smooth boundary.

Btg1—10 to 35 inches; dark gray (5Y 4/1) silty clay, black (5Y 2/1) moist; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; very hard, firm, sticky and plastic; few very fine roots; few very fine pores; common fine and medium iron-manganese concretions; neutral; gradual wavy boundary.

Btg2—35 to 45 inches; dark gray (5Y 4/1) silty clay, very dark gray (5Y 3/1) moist; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; very hard, firm, sticky and plastic; few very fine roots; few very fine pores; few fine iron-manganese concretions; neutral; clear wavy boundary.

Btg3—45 to 54 inches; 50 percent dark gray (5Y 4/1) and 50 percent light gray (5Y 7/1) silty clay, 50 percent very dark gray (5Y 3/1) moist and 50 percent gray (5Y 5/1) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; few very fine pores; few fine iron-manganese concretions; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations and common fine faint black (5Y 2/1) redoximorphic depletions; slightly alkaline; clear wavy boundary.

Bg—54 to 60 inches; light gray (5Y 7/2) silty clay loam, gray (5Y 6/1) moist; weak medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; few very fine pores; few fine iron-manganese concretions; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations and black (N 2/0) redoximorphic depletions; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: More than 35 inches
Depth to carbonates: More than 35 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam, silt loam, or silty clay

Bt horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 to 7 (2 to 5 moist)
Chroma—0 or 1
Texture—silty clay or clay

Bg horizon:
Hue—2.5Y, 5Y, or N
Value—4 to 8 (3 to 6 moist)
Chroma—0 to 2
Texture—silty clay loam, silty clay, or clay loam

Formation of the Soils

Soil forms when chemical and physical processes act on geologically deposited or accumulated material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the plant and animal life on and in the soil, the relief, and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms and in extreme cases determines it almost entirely. Finally, time is needed for changing the parent material into a soil having genetically related horizons. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. The following paragraphs relate the factors of soil formation to the soils in Brookings County.

Climate

Climate directly influences the rate of chemical and physical weathering. Brookings County has a continental climate marked by cold winters and hot summers. This climate favors the growth of grasses and the resulting accumulation of organic matter in the upper part of the soil. The climate is generally uniform throughout the county and thus as a separate factor has not affected the differentiation of the soils.

Plant and Animal Life

Plants, animals, insects, earthworms, bacteria, and fungi have an important effect on soil formation. They cause gains in organic matter, gains or losses in plant nutrients, and changes in soil structure and porosity. In Brookings County the tall and mid prairie grasses have had more influence than other living organisms on soil formation. As a result of these grasses, the surface layer of many soils has a moderate or high content of organic matter.

Earthworms, insects, and burrowing animals help to keep the soil open and porous. Bacteria, actinomycetes, and fungi decompose plant residue, thus releasing nutrients that plants use as food. Earthworm burrows result in increased infiltration capacity and better aeration (Doran and others, 1994). Earthworms ingest, transport, and excrete both organic and mineral material, thereby affecting soil properties. An important contribution of earthworms to soil environment is the conversion of plant residues into soil organic matter. Singsaas soils, for example, represent the unique profile characteristics associated with intensive working by earthworms. The classification Vermiborolls represents properties that influenced soil genesis and the kind, arrangement, and degree of development of horizons.

Parent Material

Most of the soils in Brookings County formed in glacial material derived from preglacial formations of gneiss, granite, limestone, sandstone, siltstone, and shale. The glacier ground up and mixed this material. The resultant mass is an aggregate of sand, silt, clay, and some rock fragments. When the glacier melted, the glacial material was redeposited. Some deposits consist of unsorted materials, or glacial till. Other deposits were sorted either by water as the material was deposited or by wind and water after it was deposited.

Loess is wind-deposited material that is mainly silt and very fine sand. Brookings, Kranzburg, and Vienna soils formed in thin deposits of loess.

Silty glacial till is material that was deposited on glacial ice and then reworked by water as the glacier melted. Cubden, Poinsett, and Waubay soils formed in thick deposits of silty glacial till. Singsaas soils formed in thin deposits of silty glacial till.

Loamy glacial till is a mixture of clay, silt, sand, and gravel that contains few to many cobblestones and boulders. The content of pebbles and cobblestones is

higher than that in silty glacial till. The proportion of each kind of material is determined by the kind of material picked up by the glacier. Buse, Barnes, Hamerly, and Langhei soils formed in loamy glacial till.

Glacial outwash is sandy, gravelly, and loamy material deposited by glacial meltwater. Arvilla and Sioux soils are examples of soils that formed in glacial outwash. Brandt, Estelline, Fordville, and Renshaw soils formed in silty or loamy material underlain by sand and gravel within a depth of 60 inches. Allivar, Divide, Fordtown, Marysland, Renwash, and Spottswood soils formed in loamy material underlain by sand and gravel on flood plains.

Ice-walled lake plains formed where a superglacial stream terminated in a lake. The finer textured material settled in the lake, and after a time the sediments became very thick. As the glacial ice melted, a formation resembling a mesa remained. The formerly ice-walled lake plains are higher than the surrounding landscape. Hetland soils formed in these sediments.

Badger, Oldham, Parnell, Southam, and Tonka soils formed partly or entirely in local alluvium that washed from adjacent upland soils. La Prairie, LaDelle, Lamoure, Lowe, Ludden, Moritz, and Rauville soils formed in alluvium deposited by streams.

Loamy and sandy eolian (windblown) material was deposited downwind from glacial outwash areas or stream valleys. Egeland, Embden, and Venagro soils formed in thick loamy glaciofluvial sediments. Doland and Swenoda soils formed in thin eolian deposits over loamy glacial till. Strayhoss soils formed in loamy eolian material over sandy material. Maddock soils formed in thick sandy glaciofluvial sediments.

Relief

Relief influences soil formation through its effect on drainage, runoff, erosion, plant cover, and soil temperature. In the more sloping areas of Buse soils, much of the rainfall is lost through excessive runoff. As a result of the excessive runoff, a limited amount of moisture penetrates the surface and much soil is lost through erosion. These soils are calcareous at or near the surface. The layers in which organic matter accumulates are thin.

Runoff is slower in the less sloping areas of Kranzburg and Poinsett soils than on the Buse soils. As a result, more moisture penetrates the surface of the Kranzburg and Poinsett soils and the layers in which organic matter accumulates are thicker. Also, calcium carbonate is leached to a greater depth.

Svea and Waubay soils are on footslopes and toeslopes that receive extra moisture in the form of runoff from adjacent soils. The layers in which organic matter accumulates are thicker than those in the Kranzburg and Poinsett soils. Also, calcium carbonate is leached to a greater depth. In areas where drainage is impeded, the fluctuating water table favors the concentration of calcium carbonate and other soluble salts in Cubden, Divide, Marysland, and other soils. Parnell and Southam soils are in basins where water ponds. These soils have the colors characteristic of very poorly drained soils.

Time

The length of time that soil material has been exposed to the other four factors of soil formation is reflected in the kinds of soil that have formed. The degree of profile development reflects the age of a soil. The oldest soils are on the parts of the landscape that have been stable for the longest time. In Brookings County, these are Barnes, Kranzburg, and Poinsett soils. The youngest soils either are those in which natural erosion removes nearly as much soil material as is formed through the weathering of parent material or are alluvial soils, which receive new material each time the area is flooded. Buse and Sioux soils are examples of young soils that are subject to natural erosion. La Prairie, LaDelle, and Lamoure soils are examples of young alluvial soils.

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Basin. A depressed area with no surface outlet. Examples include closed depressions on a glacial till plain or lake basins.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet. Commonly associated with high sodium conditions.

Closed depression. A low-lying area that is surrounded by higher ground and has no natural outlet for surface drainage.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or

miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Cropping system. Growing crops according to a planned system of rotation and management practices.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess salt (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits. Material moved by glaciers

and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Interfluve. An elevated area between two drainageways that sheds water to those drainageways.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Mesophytic crop. Any crop adapted to medium conditions of moisture.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Mottling, soil. Irregular spots of different colors that vary in number and size. Used to describe color patterns not related to soil wetness. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, molybdenum, chlorine, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Potential native vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the

chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Relief. The elevations or inequalities of a land surface, considered collectively.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, gravel, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots. Soil features that limit the root zone include gravel, coarse sand, bedrock, and a claypan.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Level	0 to 1 percent
Nearly level	0 to 3 percent
Gently sloping	2 to 6 percent
Moderately sloping	6 to 9 percent
Strongly sloping	9 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 40 percent
Very steep	40 percent and higher

Classes for complex slopes are as follows:

Level	0 to 1 percent
Nearly level	0 to 3 percent
Undulating	2 to 6 percent
Gently rolling	6 to 9 percent
Rolling	9 to 15 percent
Hilly	15 to 25 percent
Steep	25 to 40 percent
Very steep	40 percent and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of rock fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland. Land at a higher elevation, in general, than

the alluvial plain or stream terrace; land above the lowlands along streams.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1961-90 at Brookings, South Dakota)

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Temperature: Average	Temperature: 2 years in 10 will have-- Maximum temperature higher than--	Temperature: 2 years in 10 will have-- Minimum temperature lower than--	Temperature: Average number of growing degree days*	Precipitation: Average	Precipitation: 2 years in 10 will have-- Less than--	Precipitation: 2 years in 10 will have-- More than--	Precipitation: Average number of days with 0.10 inch or more	Precipitation: Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	20.7	-0.9	9.9	51	-31	0	0.32	0.09	0.58	1	4.3
February---	26.0	5.0	15.5	54	-29	1	.43	.11	.70	1	4.8
March------	38.5	19.1	28.8	73	-13	32	1.22	.53	1.81	3	6.5
April------	55.2	32.2	43.7	86	11	179	2.07	1.05	2.97	5	1.9
May--------	68.1	43.3	55.7	89	22	491	2.93	1.26	4.35	6	.2
June-------	77.5	53.4	65.4	96	36	757	4.32	2.35	6.05	7	.0
July-------	82.8	58.4	70.6	98	42	949	3.32	1.62	4.79	5	.0
August-----	80.4	55.3	67.9	97	37	862	2.79	1.70	3.77	4	.0
September--	70.5	45.2	57.9	93	25	528	2.52	.97	3.82	5	.0
October----	58.6	33.4	46.0	83	14	236	1.66	.49	2.72	3	.4
November---	40.6	20.3	30.5	69	-9	30	.81	.15	1.32	2	2.8
December---	25.3	5.8	15.5	54	-25	1	.33	.12	.55	1	4.4
Yearly:											
Average---	53.7	30.9	42.3	---	---	---	---	---	---	---	---
Extreme---	103	-40	---	100	-33	---	---	---	---	---	---
Total-----	---	---	---	---	---	4,067	22.74	18.39	26.79	43	25.3

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Brookings, South Dakota)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 12	May 17	May 28
2 years in 10 later than--	May 5	May 12	May 23
5 years in 10 later than--	Apr. 21	May 2	May 15
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 23	Sept. 17	Sept. 9
2 years in 10 earlier than--	Sept. 29	Sept. 22	Sept. 13
5 years in 10 earlier than--	Oct. 8	Oct. 1	Sept. 20

Table 3.--Growing Season

(Recorded in the period 1961-90 at Brookings, South Dakota)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	138	125	108
8 years in 10	146	132	114
5 years in 10	160	146	127
2 years in 10	175	160	139
1 year in 10	182	167	146

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
Aa	Allivar sandy loam, 0 to 2 percent slopes	2,204	0.4
Ar	Arlo loam, 0 to 1 percent slopes	104	*
AvB	Arvilla sandy loam, 2 to 6 percent slopes	447	*
Ba	Badger silty clay loam, 0 to 1 percent slopes	6,316	1.2
BbA	Barnes clay loam, 0 to 2 percent slopes	15,063	2.9
BbB	Barnes clay loam, 2 to 6 percent slopes	30,117	5.8
BcB	Barnes-Buse loams, 2 to 6 percent slopes	723	0.1
BeA	Brandt silty clay loam, 0 to 2 percent slopes	11,176	2.2
BeB	Brandt silty clay loam, 2 to 6 percent slopes	1,262	0.2
Bf	Brookings silty clay loam, 0 to 2 percent slopes	3,557	0.7
BgC	Buse-Barnes loams, 6 to 9 percent slopes	11,010	2.1
BgD	Buse-Barnes loams, 9 to 20 percent slopes	8,386	1.6
BhC	Buse-Barnes loams, 2 to 9 percent slopes, very stony	55	*
BhE	Buse-Barnes loams, 9 to 40 percent slopes, very stony	400	*
BkE	Buse-Lamoure, channeled, complex, 0 to 40 percent slopes	4,408	0.9
BoE	Buse-Langhei complex, 15 to 40 percent slopes	10,094	2.0
BpD	Buse-Poinsett complex, 9 to 15 percent slopes	5,537	1.1
BrD	Buse, very stony-Poinsett complex, 9 to 25 percent slopes	1,423	0.3
BsC	Buse-Singsaas complex, 6 to 9 percent slopes	2,700	0.5
BxE	Buse-Sioux complex, 9 to 40 percent slopes	964	0.2
Ca	Castlewood silty clay, 0 to 1 percent slopes	409	*
Ch	Chaska loam, channeled	248	*
Cm	Clamo silty clay, 0 to 1 percent slopes	79	*
Co	Cubden-Badger silty clay loams, 0 to 2 percent slopes	6,043	1.2
Ct	Cubden-Tonka silty clay loams, 0 to 2 percent slopes	1,663	0.3
DaB	Darnen loam, 2 to 6 percent slopes	881	0.2
DcA	Davis loam, 0 to 2 percent slopes	64	*
DcB	Davis loam, 2 to 6 percent slopes	71	*
Dm	Dimo clay loam, 0 to 2 percent slopes	161	*
Dn	Divide loam, 0 to 2 percent slopes	14,001	2.7
DoB	Doland loam, 2 to 6 percent slopes	4,733	0.9
DsA	Doland-Svea loams, 0 to 2 percent slopes	3,223	0.6
EaB	Egan-Ethan complex, 2 to 6 percent slopes	393	*
EeB	Egan-Wentworth-Trent silty clay loams, 1 to 6 percent slopes	198	*
EgA	Egeland-Embden complex, 0 to 2 percent slopes	841	0.2
EgB	Egeland-Embden complex, 2 to 6 percent slopes	870	0.2
EnA	Enet loam, 0 to 2 percent slopes, rarely flooded	103	*
EsA	Estelline silt loam, 0 to 2 percent slopes	12,887	2.5
EsB	Estelline silt loam, 2 to 6 percent slopes	4,200	0.8
EtB	Estelline-Sioux complex, 2 to 6 percent slopes	1,278	0.2
EvD	Ethan-Clarno loams, 9 to 15 percent slopes	140	*
EwC	Ethan-Egan complex, 6 to 9 percent slopes	228	*
Fa	Fairdale loam, channeled	2,518	0.5
Fb	Fordtown loam, 0 to 2 percent slopes	6,506	1.3
Fc	Fordtown-Spottswood loams, 0 to 2 percent slopes	2,503	0.5
FdA	Fordville loam, 0 to 2 percent slopes	8,463	1.6
FrB	Fordville-Renshaw loams, 2 to 6 percent slopes	4,951	1.0
Gs	Goldsmith silty clay loam, 0 to 2 percent slopes	492	*
Hb	Hamerly-Badger complex, 0 to 2 percent slopes	5,720	1.1
Hc	Hamerly-Cavour-Badger complex, 0 to 2 percent slopes	416	*
HeA	Hetland silty clay loam, 0 to 2 percent slopes	1,563	0.3
HeB	Hetland silty clay loam, 2 to 6 percent slopes	2,249	0.4
KrA	Kranzburg-Brookings silty clay loams, 0 to 2 percent slopes	20,384	4.0
KrB	Kranzburg-Brookings silty clay loams, 1 to 6 percent slopes	29,707	5.8
La	La Prairie loam, 0 to 2 percent slopes, occasionally flooded	542	0.1
Lc	La Prairie loam, 0 to 2 percent slopes, rarely flooded	1,035	0.2
Ld	LaDelle silt loam, 0 to 2 percent slopes	900	0.2
Le	Lamo silty clay loam, 0 to 1 percent slopes	220	*
Lk	Lamoure silty clay loam, 0 to 1 percent slopes	6,718	1.3
Lm	Lamoure-Rauville silty clay loams, channeled	19,995	3.9
LnB	Lanona-Swenoda sandy loams, 2 to 6 percent slopes	3,662	0.7
Lo	Lowe loam, 0 to 1 percent slopes	647	0.1

See footnote at end of table.

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
Lr	Lowe-Ludden complex, 0 to 1 percent slopes	6,081	1.2
Ls	Ludden silty clay, 0 to 1 percent slopes	2,097	0.4
Lu	Ludden, saline-Ludden silty clays, 0 to 1 percent slopes	2,861	0.6
M-W	Miscellaneous water	352	*
MaB	Maddock-Egeland sandy loams, 2 to 6 percent slopes	1,804	0.4
MaC	Maddock-Egeland sandy loams, 6 to 9 percent slopes	703	0.1
MeA	Maddock-Embden complex, 0 to 2 percent slopes	1,797	0.3
Mr	Marysland loam, 0 to 1 percent slopes	5,846	1.1
Mt	McIntosh-Badger silty clay loams, 0 to 2 percent slopes	10,040	2.0
Mu	McIntosh-Lamoure silty clay loams, 0 to 2 percent slopes	1,810	0.4
Mw	Minnewaukan loamy sand, 0 to 3 percent slopes	65	*
Mz	Moritz-Lamoure complex, 0 to 2 percent slopes	18,375	3.6
Od	Oldham silty clay loam, 0 to 1 percent slopes	3,510	0.7
Og	Orthents, gravelly	1,174	0.2
Or	Orthents, loamy	929	0.2
Pa	Parnell silty clay loam, 0 to 1 percent slopes	2,611	0.5
PbB	Poinsett-Buse-Waubay complex, 1 to 6 percent slopes	37,140	7.2
PbC	Poinsett-Buse-Waubay complex, 2 to 9 percent slopes	24,930	4.8
PwA	Poinsett-Waubay silty clay loams, 0 to 2 percent slopes	3,523	0.7
PwB	Poinsett-Waubay silty clay loams, 1 to 6 percent slopes	13,164	2.6
Ra	Rauville silty clay loam, 0 to 1 percent slopes	2,743	0.5
Rp	Rauville silty clay loam, ponded	1,521	0.3
RsB	Renshaw-Sioux complex, 2 to 6 percent slopes	2,605	0.5
RsC	Renshaw-Sioux complex, 6 to 9 percent slopes	1,874	0.4
Rw	Renwash loam, 0 to 2 percent slopes	3,749	0.7
SbB	Singsaas-Buse complex, 2 to 6 percent slopes	2,434	0.5
ScA	Singsaas-Waubay silty clay loams, 0 to 2 percent slopes	329	*
ScB	Singsaas-Waubay silty clay loams, 1 to 6 percent slopes	5,496	1.1
ShD	Sioux-Renshaw complex, 9 to 15 percent slopes	1,139	0.2
ShE	Sioux-Renshaw complex, 15 to 40 percent slopes	434	*
So	Southam silty clay loam, 0 to 1 percent slopes	8,066	1.6
Sp	Spottswood loam, 0 to 2 percent slopes	2,675	0.5
SrA	Strayhoss loam, 0 to 2 percent slopes	2,908	0.6
SrB	Strayhoss loam, 2 to 6 percent slopes	2,256	0.4
StB	Strayhoss-Maddock complex, 2 to 6 percent slopes	4,584	0.9
SvA	Svea loam, 0 to 2 percent slopes	1,566	0.3
SwB	Swenoda-Lanona sandy loams, 0 to 2 percent slopes	1,655	0.3
To	Tonka silty clay loam, 0 to 1 percent slopes	602	0.1
Tr	Trent silty clay loam, 0 to 2 percent slopes	86	*
VaA	Venagro-Svea loams, 0 to 2 percent slopes	1,315	0.3
VaB	Venagro-Svea loams, 1 to 6 percent slopes	1,706	0.3
VbB	Vienna-Brookings complex, 0 to 2 percent slopes	9.689	1.9
VbB	Vienna-Brookings complex, 1 to 6 percent slopes	12,911	2.5
VnB	Vienna-Buse complex, 2 to 6 percent slopes	1,219	0.2
VnC	Vienna-Buse complex, 6 to 9 percent slopes	5,010	1.0
W	Water	8,791	1.7
Wa	Wakonda-Chancellor silty clay loams, 0 to 2 percent slopes	67	*
Wb	Waubay silty clay loam, 0 to 2 percent slopes	709	0.1
WeA	Wentworth-Trent silty clay loams, 0 to 2 percent slopes	127	*
Wo	Worthing silty clay loam, 0 to 1 percent slopes	4	*
	Total	514,933	100.0

* Less than 0.1 percent.

Table 5.--Soil Productivity Ratings

(The abbreviation "NS" means not suited)

Soil name and map symbol	Crop rating	Range rating	Productivity rating
As-- Allivar	37.1	23.2	37.1
Ar-- Arlo	36.3	60.8	60.8
AvB-- Arvilla	31.2	20.4	31.2
Ba-- Badger	72.3	49.7	72.3
BbA-- Barnes	86.1	36.8	86.1
BbB-- Barnes	79.3	36.1	79.3
BcB-- Barnes-Buse	74.6	34.3	74.6
BeA-- Brandt	88.0	37.6	88.0
BeB-- Brandt	81.1	36.4	81.1
Bf-- Brookings	99.0	54.2	99.0
BgC-- Buse-Barnes	59.4	31.6	59.4
BgD-- Buse-Barnes	NS	30.8	30.8
BhC-- Buse-Barnes	NS	26.6	26.6
BhE-- Buse-Barnes	NS	24.7	24.7
BkE-- Buse-Lamoure	NS	35.8	35.8
BoE-- Buse-Langhei	NS	27.6	27.6
BpD-- Buse-Poinsett	NS	31.5	31.5
BrD-- Buse-Poinsett	NS	28.3	28.3
BsC-- Buse-Singsaas	61.0	31.6	61.0
BxE-- Buse-Sioux	NS	23.3	23.3
Ca-- Castlewood	44.5	32.6	44.5

Table 5.--Soil Productivity Ratings--Continued

Soil name and map symbol	Crop rating	Range rating	Productivity rating
Ch: Chaska	NS	58.0	58.0
Cm: Clamo	44.5	57.1	57.1
Co: Cubden-Badger	73.2	47.1	73.2
Ct: Cubden-Tonka	58.2	41.2	58.2
DaB: Darnen	88.1	43.5	88.1
DcA: Davis	93.1	52.5	93.1
DcB: Davis	88.1	44.0	88.1
Dm: Dimo	73.7	50.6	73.7
Dn: Divide	66.0	43.7	66.0
DoB: Doland	82.9	36.4	82.9
DsA: Doland-Svea	90.8	40.8	90.8
EaB: Egan-Ethan	78.5	34.2	78.5
EeB: Egan-Wentworth-Trent	88.9	40.7	88.9
EgA: Egeland-Embden	67.2	33.6	67.2
EgB: Egeland-Embden	62.5	33.0	62.5
EnA: Enet	60.9	34.4	60.9
EsA: Estelline	70.6	32.4	70.6
EsB: Estelline	64.6	32.0	64.6
EtB: Estelline-Sioux	49.5	26.5	49.5
EvD: Ethan-Clarno	NS	29.2	29.2
EwC: Ethan-Egan	63.9	31.1	63.9

Table 5.--Soil Productivity Ratings--Continued

Soil name and map symbol	Crop rating	Range rating	Productivity rating
Fa Fairdale	NS	35.4	35.4
Fb Fordtown	60.9	34.4	60.9
Fc Fordtown-Spottswood	65.4	40.0	65.4
FdA Fordville	59.8	30.6	59.8
FrB Fordville-Renshaw	48.3	26.0	48.3
Gs Goldsmith	95.2	49.2	95.2
Hb Hamerly-Badger	72.5	46.5	72.5
Hc Hamerly-Cavour-Badger	59.4	38.7	59.4
HeA Hetland	87.0	35.7	87.0
HeB Hetland	80.8	35.0	80.8
KrA Kranzburg-Brookings	93.9	43.3	93.9
KrB Kranzburg-Brookings	88.8	41.9	88.8
La La Prairie	85.0	51.7	85.0
Lc La Prairie	93.1	41.9	93.1
Ld LaDelle	86.5	54.2	86.5
Le Lamo	63.4	64.5	64.5
Lk Lamoure	63.4	70.2	70.2
Lm Lamoure-Rauville	NS	50.7	50.7
LnB Lanona-Swenoda	64.4	25.4	64.4
Lo Lowe	43.4	59.8	59.8
Lr Lowe-Ludden	40.1	53.1	53.1

Table 5.--Soil Productivity Ratings--Continued

Soil name and map symbol	Crop rating	Range rating	Productivity rating
Ls. Ludden	35.5	43.4	43.4
Lu. Ludden, saline-Ludden	26.0	30.2	30.2
M-W. Miscellaneous water			
MaB. Maddock-Egeland	56.6	30.4	56.6
MaC. Maddock-Egeland	46.8	29.4	46.8
MeA. Maddock-Embden	64.2	31.7	64.2
Mr. Marysland	36.3	61.1	61.1
Mt. McIntosh-Badger	74.2	47.5	74.2
Mu. McIntosh-Lamoure	67.8	51.1	67.8
Mw. Minnewaukan	41.5	38.6	41.5
Mz. Moritz-Lamoure	65.0	53.1	65.0
Od. Oldham	NS	26.2	26.2
Og. Orthents	NS	10.4	10.4
Or. Orthents	52.7	28.0	52.7
Pa. Parnell	NS	31.6	31.6
PbB. Poinsett-Buse-Waubay	83.3	39.3	83.3
PbC. Poinsett-Buse-Waubay	73.6	36.3	73.6
PwA. Poinsett-Waubay	95.7	43.9	95.7
PwB. Poinsett-Waubay	90.6	42.4	90.6
Ra. Rauville	NS	32.2	32.2
Rp. Rauville	NS	5.6	5.6

Table 5.--Soil Productivity Ratings--Continued

Soil name and map symbol	Crop rating	Range rating	Productivity rating
RsB---------------------------- Renshaw-Sioux	29.3	20.0	29.3
RsC---------------------------- Renshaw-Sioux	22.9	18.9	22.9
Rw----------------------------- Renwash	39.4	24.3	39.4
SbB---------------------------- Singsaas-Buse	76.0	34.3	76.0
ScA---------------------------- Singsaas-Waubay	92.6	42.4	92.6
ScB---------------------------- Singsaas-Waubay	87.1	41.0	87.1
ShD---------------------------- Sioux-Renshaw	NS	17.7	17.7
ShE---------------------------- Sioux-Renshaw	NS	16.3	16.3
So----------------------------- Southam	NS	5.6	5.6
Sp----------------------------- Spottswood	73.5	50.9	73.5
SrA---------------------------- Strayhoss	79.3	36.8	79.3
SrB---------------------------- Strayhoss	75.1	34.8	75.1
StB---------------------------- Strayhoss-Maddock	68.4	32.7	68.4
SvA---------------------------- Svea	94.7	48.0	94.7
SwA---------------------------- Swenoda-Lanona	71.0	29.1	71.0
To----------------------------- Tonka	39.0	32.8	39.0
Tr----------------------------- Trent	100.0	53.0	100.0
VaA---------------------------- Venagro-Svea	92.8	43.2	92.8
VaB---------------------------- Venagro-Svea	88.3	41.9	88.3
VbA---------------------------- Vienna-Brookings	91.8	43.5	91.8
VbB---------------------------- Vienna-Brookings	85.9	41.3	85.9
VnB---------------------------- Vienna-Buse	76.4	35.5	76.4

Table 5.--Soil Productivity Ratings--Continued

Soil name and map symbol	Crop rating	Range rating	Productivity rating
VnC: Vienna-Buse	65.2	33.9	65.2
W. Water			
Wa: Wakonda-Chancellor	73.0	48.3	73.0
Wb: Waubay	100.0	52.9	100.0
WeA: Wentworth-Trent	94.7	43.1	94.7
Wo: Worthing	NS	29.8	29.8

Table 6.--Yields per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Corn	Barley	Soybeans	Oats	Spring wheat	Bromegrass-alfalfa	Alfalfa hay
	Bu	Bu	Bu	Bu	Bu	AUM*	Tons
Aa-------------- Allivar	26	27	10	32	18	1.8	2.1
Ar-------------- Arlo	50	19	15	22	13	2.7	0.4
AvB------------- Arvilla	22	23	8	27	15	1.6	1.8
Ba-------------- Badger	82	43	31	53	29	3.5	1.9
BbA------------- Barnes	92	55	33	70	38	3.0	3.4
BbB------------- Barnes	83	51	30	64	35	2.8	3.3
BcB------------- Barnes-Buse	78	49	27	61	33	2.7	3.1
BeA------------- Brandt	94	57	34	71	39	3.0	3.5
BeB------------- Brandt	84	52	31	66	36	2.8	3.3
Bf-------------- Brookings	106	62	38	77	42	5.7	4.3
BgC------------- Buse-Barnes	60	39	20	49	27	2.3	2.7
BgD------------- Buse-Barnes	42	29	14	36	20	2.0	2.3
BhC, BhE. Buse-Barnes							
BkE. Buse-Lamoure							
BoE. Buse-Langhei							
BpD------------- Buse-Poinsett	46	33	16	40	22	2.6	2.4
BrD------------- Buse-Poinsett	---	---	---	---	---	1.2	1.1
BsC------------- Buse-Singsaas	61	40	21	49	27	2.4	2.7
BxE. Buse-Sioux							

See footnote at end of table.

Table 6.--Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Corn	Barley	Soybeans	Oats	Spring wheat	Bromegrass-alfalfa	Alfalfa hay
	Bu	Bu	Bu	Bu	Bu	AUM*	Tons
Ca-------------- Castlewood	65	23	23	28	15	3.5	1.8
Ch. Chaska							
Cm-------------- Clamo	65	23	23	28	15	2.6	0.5
Co-------------- Cubden-Badger	82	44	28	54	30	3.3	3.1
Ct-------------- Cubden-Tonka	71	33	24	41	22	2.5	1.8
DaB------------- Darnen	94	55	34	70	38	3.2	3.7
DcA------------- Davis	100	59	36	73	40	3.5	3.6
DcB------------- Davis	94	55	34	70	38	3.2	3.7
Dm-------------- Dimo	81	45	30	55	30	2.9	3.0
Dn-------------- Divide	73	40	21	49	28	3.0	2.5
DoB------------- Doland	89	53	32	66	36	2.9	3.4
DsA------------- Doland-Svea	98	57	35	72	39	3.2	3.7
EaB------------- Egan-Ethan	79	50	29	62	34	3.4	3.2
EeB------------- Egan-Wentworth-Trent	90	56	34	70	38	3.8	3.6
EgA------------- Egeland-Embden	67	45	25	54	30	2.5	2.9
EgB------------- Egeland-Embden	61	42	22	50	28	2.4	2.7
EnA------------- Enet	56	42	21	50	28	2.4	2.8
EsA------------- Estelline	69	49	25	58	32	2.5	2.9
EsB------------- Estelline	60	45	22	55	31	2.3	2.7
EtB------------- Estelline-Sioux	44	36	16	43	24	1.9	2.2

See footnote at end of table.

Table 6.--Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Corn	Barley	Soybeans	Oats	Spring wheat	Bromegrass-alfalfa	Alfalfa hay
	Bu	Bu	Bu	Bu	Bu	AUM*	Tons
EvD------------- Ethan-Clarno	39	29	14	35	19	---	---
EwC------------- Ethan-Egan	62	42	22	51	28	2.9	2.7
Fa. Fairdale							
Fb-------------- Fordtown	56	42	21	50	28	2.4	2.8
Fc-------------- Fordtown-Spottswood	65	43	24	51	28	2.6	2.9
FdA------------- Fordville	56	42	21	50	28	2.2	2.5
FrB------------- Fordville-Renshaw	42	34	16	41	23	1.9	2.2
Gs-------------- Goldsmith	102	75	37	75	41	3.4	4.0
Hb-------------- Hamerly-Badger	85	43	28	53	29	3.2	2.4
Hc-------------- Hamerly-Cavour-Badger	89	56	33	69	38	2.7	2.1
HeA------------- Hetland	89	56	33	69	38	3.5	3.4
HeB------------- Hetland	81	52	30	64	35	3.4	3.3
KrA------------- Kranzburg-Brookings	101	59	36	74	40	3.3	3.8
KrB------------- Kranzburg-Brookings	95	56	34	71	38	3.2	3.7
La-------------- La Prairie	95	85	34	65	35	3.5	3.0
Lc-------------- La Prairie	100	59	36	73	40	3.5	3.6
Ld-------------- LaDelle	97	53	35	66	36	3.5	3.0
Le-------------- Lamo	76	38	23	61	26	3.5	1.3

See footnote at end of table.

Table 6.--Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Corn	Barley	Soybeans	Oats	Spring wheat	Bromegrass-alfalfa	Alfalfa hay
	Bu	Bu	Bu	Bu	Bu	AUM*	Tons
Lk-------------- Lamoure	76	38	23	47	26	3.5	1.3
Lm. Lamoure-Rauville							
LnB------------- Lanona-Swenoda	64	43	23	51	28	2.3	2.7
Lo-------------- Lowe	59	23	18	28	15	3.0	0.6
Lr-------------- Lowe-Ludden	58	21	18	25	14	2.4	0.5
Ls-------------- Ludden	55	18	18	21	12	1.6	0.4
Lu-------------- Ludden, saline-Ludden	41	13	13	15	9	1.6	0.3
M-W. Miscellaneous water							
MaB------------- Maddock-Egeland	54	38	20	45	25	2.2	2.5
MaC------------- Maddock-Egeland	41	32	15	38	21	2.0	2.3
MeA------------- Maddock-Embden	62	42	23	51	28	2.6	2.8
Mr-------------- Marysland	50	19	15	22	13	2.7	0.4
Mt-------------- McIntosh-Badger	87	44	28	55	30	3.2	2.5
Mu-------------- McIntosh-Lamoure	81	40	25	49	27	3.2	2.2
Mw-------------- Minnewaukan	40	27	16	32	18	2.0	1.6
Mz-------------- Moritz-Lamoure	78	38	24	46	26	3.2	2.0
Od. Oldham							
Og. Orthents							
Or-------------- Orthents	52	35	17	43	24	2.1	2.4

See footnote at end of table.

Table 6.--Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Corn	Barley	Soybeans	Oats	Spring wheat	Bromegrass-alfalfa	Alfalfa hay
	Bu	Bu	Bu	Bu	Bu	AUM*	Tons
Pa. Parnell							
PbB------------- Poinsett-Buse-Waubay	84	53	31	66	36	3.6	3.4
PbC------------- Poinsett-Buse-Waubay	72	47	27	58	32	3.3	3.1
PwA------------- Poinsett-Waubay	97	60	37	75	41	4.0	3.8
PwB------------- Poinsett-Waubay	92	57	35	71	39	3.8	3.7
Ra, Rp. Rauville							
RsB------------- Renshaw-Sioux	20	22	8	26	14	1.5	1.7
RsC------------- Renshaw-Sioux	14	18	5	20	11	1.3	1.4
Rw-------------- Renwash	30	28	11	32	18	1.9	2.2
SbB------------- Singsaas-Buse	80	49	28	62	34	2.7	3.1
ScA------------- Singsaas-Waubay	99	59	36	74	40	3.2	3.8
ScB------------- Singsaas-Waubay	92	55	33	70	38	3.1	3.6
ShD, ShE. Sioux-Renshaw							
So. Southam							
Sp-------------- Spottswood	81	45	30	55	30	2.9	3.0
SrA------------- Strayhoss	82	52	30	63	35	2.8	3.2
SrB------------- Strayhoss	77	49	28	60	33	2.7	3.1
StB------------- Strayhoss-Maddock	68	45	25	55	30	2.5	2.9
SvA------------- Svea	102	59	37	74	40	3.4	4.1

See footnote at end of table.

Table 6.--Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Corn	Barley	Soybeans	Oats	Spring wheat	Bromegrass-alfalfa	Alfalfa hay
	Bu	Bu	Bu	Bu	Bu	AUM*	Tons
SwA------------- Swenoda-Lanona	72	47	26	57	31	2.6	3.0
To-------------- Tonka	58	19	22	24	13	1.7	0.5
Tr-------------- Trent	101	62	38	77	42	4.4	4.3
VaA------------- Venagro-Svea	100	59	36	74	40	3.2	3.7
VaB------------- Venagro-Svea	94	56	34	71	38	3.1	3.6
VbA------------- Vienna-Brookings	98	58	35	73	40	3.2	3.7
VbB------------- Vienna-Brookings	90	55	33	68	37	3.0	3.5
VnB------------- Vienna-Buse	81	50	28	62	34	2.7	3.1
VnC------------- Vienna-Buse	66	43	23	53	29	2.5	2.8
W. Water							
Wa-------------- Wakonda-Chancellor	82	44	27	54	30	3.3	2.6
Wb-------------- Waubay	101	62	38	77	42	4.4	4.3
WeA------------- Wentworth-Trent	97	60	36	74	40	3.9	3.8
Wo. Worthing							

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Table 7.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
Ar	Arlo loam, 0 to 1 percent slopes (where drained)
Ba	Badger silty clay loam, 0 to 1 percent slopes (where drained)
BbA	Barnes clay loam, 0 to 2 percent slopes
BbB	Barnes clay loam, 2 to 6 percent slopes
BcB	Barnes-Buse loams, 2 to 6 percent slopes
BeA	Brandt silty clay loam, 0 to 2 percent slopes
BeB	Brandt silty clay loam, 2 to 6 percent slopes
Bf	Brookings silty clay loam, 0 to 2 percent slopes
Ca	Castlewood silty clay, 0 to 1 percent slopes (where drained)
Cm	Clamo silty clay, 0 to 1 percent slopes (where drained)
Co	Cubden-Badger silty clay loams, 0 to 2 percent slopes (where drained)
Ct	Cubden-Tonka silty clay loams, 0 to 2 percent slopes (where drained)
DaB	Darnen loam, 2 to 6 percent slopes
DcA	Davis loam, 0 to 2 percent slopes
DcB	Davis loam, 2 to 6 percent slopes
Dm	Dimo clay loam, 0 to 2 percent slopes
Dn	Divide loam, 0 to 2 percent slopes
DoB	Doland loam, 2 to 6 percent slopes
DsA	Doland-Svea loams, 0 to 2 percent slopes
EaB	Egan-Ethan complex, 2 to 6 percent slopes
EeB	Egan-Wentworth-Trent silty clay loams, 1 to 6 percent slopes
EgA	Egeland-Embden complex, 0 to 2 percent slopes
EgB	Egeland-Embden complex, 2 to 6 percent slopes
EnA	Enet loam, 0 to 2 percent slopes, rarely flooded
EsA	Estelline silt loam, 0 to 2 percent slopes
EsB	Estelline silt loam, 2 to 6 percent slopes
Fb	Fordtown loam, 0 to 2 percent slopes
Fc	Fordtown-Spottswood loams, 0 to 2 percent slopes
FdA	Fordville loam, 0 to 2 percent slopes
FrB	Fordville-Renshaw loams, 2 to 6 percent slopes (where irrigated)
Gs	Goldsmith silty clay loam, 0 to 2 percent slopes
Hb	Hamerly-Badger complex, 0 to 2 percent slopes (where drained)
HeA	Hetland silty clay loam, 0 to 2 percent slopes
HeB	Hetland silty clay loam, 2 to 6 percent slopes
KrA	Kranzburg-Brookings silty clay loams, 0 to 2 percent slopes
KrB	Kranzburg-Brookings silty clay loams, 1 to 6 percent slopes
La	La Prairie loam, 0 to 2 percent slopes, occasionally flooded
Lc	La Prairie loam, 0 to 2 percent slopes, rarely flooded
Ld	LaDelle silt loam, 0 to 2 percent slopes
Le	Lamo silty clay loam, 0 to 1 percent slopes (where drained)
Lk	Lamoure silty clay loam, 0 to 1 percent slopes (where drained)
LnB	Lanona-Swenoda sandy loams, 2 to 6 percent slopes
Lo	Lowe loam, 0 to 1 percent slopes (where drained)
Lr	Lowe-Ludden complex, 0 to 1 percent slopes (where drained)
Ls	Ludden silty clay, 0 to 1 percent slopes (where drained)
MaB	Maddock-Egeland sandy loams, 2 to 6 percent slopes (where irrigated)
MeA	Maddock-Embden complex, 0 to 2 percent slopes (where irrigated)
Mr	Marysland loam, 0 to 1 percent slopes (where drained)
Mt	McIntosh-Badger silty clay loams, 0 to 2 percent slopes (where drained)
Mu	McIntosh-Lamoure silty clay loams, 0 to 2 percent slopes (where drained)
Mz	Moritz-Lamoure complex, 0 to 2 percent slopes (where drained)
PbB	Poinsett-Buse-Waubay complex, 1 to 6 percent slopes
PwA	Poinsett-Waubay silty clay loams, 0 to 2 percent slopes
PwB	Poinsett-Waubay silty clay loams, 1 to 6 percent slopes
Rw	Renwash loam, 0 to 2 percent slopes (where irrigated)
SbB	Singsaas-Buse complex, 2 to 6 percent slopes
ScA	Singsaas-Waubay silty clay loams, 0 to 2 percent slopes
ScB	Singsaas-Waubay silty clay loams, 1 to 6 percent slopes
Sp	Spottswood loam, 0 to 2 percent slopes

Table 7.--Prime Farmland--Continued

Map symbol	Soil name
SrA	Strayhoss loam, 0 to 2 percent slopes
SrB	Strayhoss loam, 2 to 6 percent slopes
StB	Strayhoss-Maddock complex, 2 to 6 percent slopes (where irrigated)
SvA	Svea loam, 0 to 2 percent slopes
SwA	Swenoda-Lanona sandy loams, 0 to 2 percent slopes
To	Tonka silty clay loam, 0 to 1 percent slopes (where drained)
Tr	Trent silty clay loam, 0 to 2 percent slopes
VaA	Venagro-Svea loams, 0 to 2 percent slopes
VaB	Venagro-Svea loams, 1 to 6 percent slopes
VbA	Vienna-Brookings complex, 0 to 2 percent slopes
VbB	Vienna-Brookings complex, 1 to 6 percent slopes
VnB	Vienna-Buse complex, 2 to 6 percent slopes
Wa	Wakonda-Chancellor silty clay loams, 0 to 2 percent slopes (where drained)
Wb	Waubay silty clay loam, 0 to 2 percent slopes
WeA	Wentworth-Trent silty clay loams, 0 to 2 percent slopes

Table 8.--Rangeland Characteristic Vegetation and Productivity

(See text for definitions of terms used in this table)

Range site, soil name, and map symbols	Potential natural plant community: Common plant name	Composition	Potential annual production for kind of growing season: Favorable	Average	Unfavorable
		Pct	Lb/acre	Lb/acre	Lb/acre
Clayey Overflow	Big bluestem	35	4,400	3,800	2,700
Clamo: Cm	Prairie cordgrass	15			
	Little bluestem	15			
	Switchgrass	10			
	Sideoats grama	10			
	Indiangrass	5			
	Sedges	5			
	Climax forbs	5			
Claypan	Western wheatgrass	35	3,100	2,600	1,800
Cavour: Hc	Needlegrasses	25			
	Big bluestem	10			
	Switchgrass	10			
	Bluegrasses	5			
	Blue grama	5			
	Sedges	5			
	Climax forbs	5			
Limy Subirrigated	Little bluestem	40	5,300	4,400	2,800
Cubden: Co, Ct	Big bluestem	20			
Divide: Dn	Needlegrasses	20			
Hamerly: Hb, Hc	Blue grama	5			
McIntosh: Mt, Mu	Bluegrasses	5			
Moritz: Mz	Sedges	5			
Wakonda: Wa	Climax forbs	5			
Loamy Overflow	Big bluestem	60	5,500	4,600	3,200
Badger: Ba, Co, Hb, Hc, Mt	Sedges	10			
	Switchgrass	5			
Brookings: Bf, KrA, KrB, VbA, VbB	Canada wildrye	5			
	Porcupinegrass	5			
Chancellor: Wa	Little bluestem	5			
Davis: DcA	Sideoats grama	5			
Dimo: Dm	Climax forbs	5			
Fairdale: Fa					
Goldsmith: Gs					
La Prairie: La					
LaDelle: Ld					
Spottswood: Fc, Sp					
Svea: DsA, SvA, VaA, VaB					
Trent: EeB, Tr, WeA					
Waubay: PbB, PwA, PwB, ScA, ScB, Wb					
Saline Lowland	Cordgrass	55	4,800	4,400	3,500
Ludden, saline: Lu	Nuttall alkaligrass	15			
	Western wheatgrass	10			
	Switchgrass	10			
	Bluegrass	5			
	Sedges	5			
Sandy	Big bluestem or sand bluestem	35	3,900	3,200	2,200
Egeland: EgA, EgB, MaB, MaC	Little bluestem	25			
	Prairie sandreed	15			
Embden: EgA, EgB, MeA	Needlegrasses	10			
Lanona: LnB, SwA	Sideoats grama	5			
Maddock: MaB, MaC, MeA, StB	Sedges	5			
	Climax forbs	5			
Swenoda: LnB, SwA					

Table 8.--Rangeland Characteristic Vegetation and Productivity--Continued

Range site, soil name, and map symbols	Common plant name	Composition	Favorable	Average	Unfavorable
		Pct	Lb/acre	Lb/acre	Lb/acre
Shallow Marsh	Sedges	45	7,400	6,800	5,400
Parnell: Pa	Rivergrass	30			
Worthing: Wo	Climax forbs	10			
	American mannagrass	5			
	Reedgrasses	5			
	Prairie cordgrass	5			
Shallow to Gravel	Needleandthread	45	2,900	2,400	1,500
Allivar: Aa	Little bluestem	10			
Arvilla: AvB	Prairie dropseed	10			
Renshaw: FrB, RsB, RsC, ShD, ShE	Blue grama and hairy grama	10			
	Plains muhly	5			
Renwash: Rw	Bluegrasses	5			
	Sedges	5			
	Climax forbs	5			
	Climax shrubs	5			
Silty	Little bluestem	30	4,200	3,500	2,400
Barnes: BbA, BbB, BcB, BgC, BgD, BhC, BhE	Big bluestem	20			
	Needlegrasses	20			
Brandt: BeA, BeB	Prairie dropseed	5			
Clarno: EvD	Blue grama	5			
Darnen: DaB	Bluegrasses	5			
Davis: DcB	Sedges	5			
Doland: DoB, DsA	Climax forbs	5			
Egan: EaB, EeB, EwC	Climax shrubs	5			
Enet: EnA					
Estelline: EsA, EsB, EtB					
Fordtown: Fb, Fc					
Fordville: FdA, FrB					
Hetland: HeA, HeB					
Kranzburg: KrA, KrB					
La Prairie: Lc					
Poinsett: BpD, BrD, PbB, PbC, PwA, PwB					
Singsaas: BsC, SbB, ScA, ScB					
Strayhoss: SrA, SrB, StB					
Venagro: VaA, VaB					
Vienna: VbA, VbB, VnB, VnC					
Waubay: PbC					
Wentworth: EeB, WeA					
Subirrigated	Big bluestem	50	5,900	5,400	4,300
Arlo: Ar	Indiangrass	10			
Chaska: Ch	Little bluestem	10			
Lamo: Le	Switchgrass	10			
Lamoure: BkE, Lk, Lm, Mu, Mz	Canada wildrye	5			
	Prairie cordgrass	5			
Lowe: Lo, Lr	Sedges	5			
Marysland: Mr	Climax forbs	5			
Minnewaukan: Mw					
Thin Upland	Little bluestem	35	3,500	2,900	2,000
Buse: BcB, BgC, BgD, BhC, BhE, BkE, BoE, BpD, BrD, BsC, BxE, PbB, PbC, SbB, VnB, VnC	Needlegrasses	20			
	Big bluestem	10			
	Prairie dropseed	10			
	Sideoats grama	5			
	Blue grama	5			
Ethan: EaB, EvD, EwC	Sedges	5			
Langhei: BoE	Climax forbs	5			
Orthents: Or	Climax shrubs	5			

Table 8.--Rangeland Characteristic Vegetation and Productivity--Continued

Range site, soil name, and map symbols	Potential natural plant community		Potential annual production for kind of growing season		
	Common plant name	Composition	Favorable	Average	Unfavorable
		Pct	Lb/acre	Lb/acre	Lb/acre
Very Shallow-------------	Needleandthread--------------	55	2,200	1,900	1,100
Orthents: Og	Blue grama and hairy grama---	20			
Sioux: BxE, EtB, RsB,	Sedges-----------------------	10			
RsC, ShD, ShE	Plains muhly-----------------	5			
	Sideoats grama---------------	5			
	Climax forbs-----------------	5			
Wetland------------------	Prairie cordgrass------------	60	7,000	6,400	5,100
Castlewood: Ca	Reedgrasses------------------	10			
Ludden: Lr, Ls, Lu	Reed canarygrass-------------	10			
Oldham: Od	Sedges-----------------------	5			
Rauville: Lm, Ra	Switchgrass------------------	5			
	Canada wildrye---------------	5			
	Bluegrasses------------------	5			
Wet Meadow---------------	Sedges-----------------------	40	5,000	4,600	3,200
Tonka: Ct, To	Reedgrasses------------------	15			
	Prairie cordgrass------------	15			
	Reed canarygrass-------------	10			
	Western wheatgrass-----------	5			
	Bluegrasses------------------	5			
	Rushes-----------------------	5			
	Climax forbs-----------------	5			

Table 9.--Windbreaks and Environmental Plantings

(In Brookings County, none of the soils are assigned to windbreak suitability group 7. Dashes indicate that trees generally do not grow to the given height on the soils in that group)

Windbreak suitability group, soil name, and map symbols	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
Group 1----------- Brookings: Bf, KrA, KrB, VbA, VbB Davis: DcA Dimo: Dm Embden: EgA, EgB, MeA Fairdale: Fa Goldsmith: Gs La Prairie: La, Lc LaDelle: Ld Spottswood: Fc, Sp Svea: DsA, SvA, VaA, VaB Trent: EeB, Tr, WeA Waubay: PbB, PbC, PwA, PwB, ScA, ScB, Wb	Golden currant, Hansen hedgerose, juneberry, Mongolian cherry, Nanking cherry, Peking cotoneaster, redosier dogwood, skunkbush sumac, western sandcherry.	American plum, Amur honeysuckle, Amur maple, caragana, common chokecherry, common lilac, European cotoneaster, late lilac, Manchurian apricot, Sargent crabapple, Siberian apricot, silver buffaloberry.	Arnold hawthorn, Austrian pine, Black Hills spruce, black walnut, blue spruce, bur oak, eastern redcedar, European birdcherry, Manchurian crabapple, ponderosa pine, Rocky Mountain juniper, Russian-olive, Scotch pine, Siberian crabapple, Ussurian pear, white spruce.	European larch, golden willow, green ash, hackberry, honeylocust, laurel willow, Siberian larch, silver maple, white poplar, white willow.	Carolina poplar, eastern cottonwood, northwest poplar, plains cottonwood, robusta poplar, Siberian elm, Siouxland cottonwood.
Group 1K---------- Chaska: Ch Cubden: Co, Ct Divide: Dn Hamerly: Hb, Hc McIntosh: Mt, Mu Moritz: Mz Wakonda: Wa	Golden currant, Hansen hedgerose, juneberry, Mongolian cherry, Nanking cherry, Peking cotoneaster, redosier dogwood, skunkbush sumac, western sandcherry.	American plum, Amur honeysuckle, caragana, common chokecherry, common lilac, European cotoneaster, late lilac, Manchurian apricot, Sargent crabapple, Siberian apricot, silver buffaloberry.	Arnold hawthorn, Austrian pine, Black Hills spruce, black walnut, blue spruce, bur oak, eastern redcedar, European birdcherry, Manchurian crabapple, ponderosa pine, Rocky Mountain juniper, Russian-olive, Scotch pine, Siberian crabapple, Ussurian pear, white spruce.	European larch, golden willow, green ash, hackberry, honeylocust, laurel willow, Siberian larch, white poplar, white willow.	Carolina poplar, eastern cottonwood, northwest poplar, plains cottonwood, robusta poplar, Siberian elm, Siouxland cottonwood.
Group 2----------- Badger: Ba, Co, Hb, Hc, Mt Chancellor: Wa Minnewaukan: Mw	False indigo, golden currant, highbush cranberry, redosier dogwood.	Amur maple, sandbar willow.	Boxelder, European larch, Russian-olive, Siberian larch, white spruce.	Golden willow, green ash, laurel willow, silver maple, white poplar, white willow.	Carolina poplar, eastern cottonwood, northwest poplar, plains cottonwood, robusta poplar, Siouxland cottonwood.

Table 9.--Windbreaks and Environmental Plantings--Continued

Windbreak suitability group, soil name, and map symbols	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
Group 2K Lamo: Le Lamoure: BkE, Lk, Lm, Mu, Mz	False indigo, golden currant, highbush cranberry, redosier dogwood.	Sandbar willow	Boxelder, European larch, Russian-olive, Siberian larch, white spruce.	Golden willow, green ash, laurel willow, white poplar, white willow.	Carolina poplar, eastern cottonwood, northwest poplar, plains cottonwood, robusta poplar, Siouxland cottonwood.
Group 3 Barnes: BbA, BbB, BcB, BgC, BgD Brandt: BeA, BeB Clarno: EvD Darnen: DaB Davis: DcB Doland: DoB, DsA Egan: EaB, EeB, EwC Kranzburg: KrA, KrB Poinsett: BpD, BrD, PbB, PbC, PwA, PwB Singsaas: BsC, SbB, ScA, ScB Strayhoss: SrA, SrB, StB Venagro: VaA, VaB Vienna: VbA, VbB, VnB, VnC Wentworth: EeB, WeA	Golden currant, Hansen hedgerose, late lilac, Mongolian cherry, Nanking cherry, Peking cotoneaster, redosier dogwood, Russian almond, skunkbush sumac, western sandcherry.	American plum, Amur honeysuckle, Amur maple, Arnold hawthorn, caragana, common chokecherry, common lilac, eastern redcedar, European cotoneaster, Manchurian apricot, Rocky Mountain juniper, Siberian apricot, silver buffaloberry.	Austrian pine, Black Hills spruce, black walnut, blue spruce, bur oak, European birdcherry, European larch, hackberry, Manchurian crabapple, ponderosa pine, Russian-olive, Scotch pine, Siberian crabapple, Ussurian pear, white poplar, white spruce.	Green ash, honeylocust, silver maple.	Siberian elm.
Group 4 Hetland: HeA, HeB	Amur honeysuckle, European cotoneaster, golden currant, Nanking cherry, Peking cotoneaster, Russian almond, silver buffaloberry, skunkbush sumac.	American plum, Arnold hawthorn, caragana, common chokecherry, common lilac, eastern redcedar, European birdcherry, Manchurian apricot, Manchurian crabapple, Rocky Mountain juniper, Siberian apricot, Siberian crabapple, Ussurian pear.	Bur oak, hackberry, honeylocust, ponderosa pine, Russian-olive, white poplar.	Green ash, Siberian elm.	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Windbreak suitability group, soil name, and map symbols	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
Group 5: Egeland: EgA, EgB, MaB, MaC; Lanona: LnB, SwA; Maddock: MaB, MaC, MeA, StB; Swenoda: LnB, SwA	Amur honeysuckle, European cotoneaster, golden currant, Nanking cherry, Peking cotoneaster, Russian almond, silver buffaloberry, skunkbush sumac, western sandcherry.	American plum, Arnold hawthorn, caragana, common chokecherry, common lilac, eastern redcedar, Manchurian apricot, Rocky Mountain juniper, Siberian apricot, Ussurian pear.	Bur oak, green ash, hackberry, honeylocust, Manchurian crabapple, ponderosa pine, Russian-olive, Siberian crabapple, white poplar.	Siberian elm	---
Group 6G: Allivar: Aa; Arvilla: AvB; Enet: EnA; Estelline: EsA, EsB, EtB; Fordtown: Fb, Fc; Fordville: FdA, FrB; Renshaw: FrB, RsB, RsC; Renwash: Rw	Amur honeysuckle, caragana, common lilac, European cotoneaster, Peking cotoneaster, silver buffaloberry.	Eastern redcedar, hackberry, Manchurian crabapple, Rocky Mountain juniper, Russian-olive, Siberian crabapple, Ussurian pear.	Green ash, honeylocust, ponderosa pine, white poplar.	Siberian elm	---
Group 8: Buse: BcB, BgC, BgD, BpD, BsC, PbB, PbC, SbB, VnB, VnC; Ethan: EaB, EvD, EwC; Orthents: Or	American plum, Amur honeysuckle, caragana, common lilac, European cotoneaster, golden currant, Peking cotoneaster, silver buffaloberry.	Eastern redcedar, hackberry, Rocky Mountain juniper, Russian-olive, Ussurian pear, white poplar.	Green ash, honeylocust, ponderosa pine, Siberian elm.	---	---
Group 9L: Cavour: Hc	Caragana, common lilac, Russian almond, silver buffaloberry, Ussurian pear.	Eastern redcedar, green ash, ponderosa pine, Rocky Mountain juniper, Russian-olive, Siberian elm.	---	---	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Windbreak suitability group, soil name, and map symbols	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
Group 10----------	---	---	---	---	---
Arlo: Ar					
Barnes: BhC, BhE					
Buse: BhC, BhE, BkE, BoE, BrD, BxE					
Castlewood: Ca					
Clamo: Cm					
Langhei: BoE					
Lowe: Lo, Lr					
Ludden: Lr, Ls, Lu					
Ludden, saline: Lu					
Marysland: Mr					
Oldham: Od					
Orthents: Og					
Parnell: Pa					
Rauville: Lm, Ra, Rp					
Renshaw: ShD, ShE					
Sioux: BxE, EtB, RsB, RsC, ShD, ShE					
Southam: So					
Tonka: Ct, To					
Worthing: Wo					

Table 10.--Recreational Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Aa: Allivar	Severe: flooding.	Slight	Slight	Slight.
Ar: Arlo	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
AvB: Arvilla	Slight	Slight	Moderate: slope.	Slight.
Ba: Badger	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
BbA: Barnes	Slight	Slight	Moderate: small stones.	Slight.
BbB: Barnes	Slight	Slight	Moderate: slope, small stones.	Slight.
BcB:				
Barnes	Slight	Slight	Moderate: slope, small stones.	Slight.
Buse	Slight	Slight	Moderate: slope, small stones.	Slight.
BeA: Brandt	Slight	Slight	Slight	Slight.
BeB: Brandt	Slight	Slight	Moderate: slope.	Slight.
Bf: Brookings	Severe: wetness.	Slight	Moderate: wetness.	Slight.
BgC:				
Buse	Slight	Slight	Severe: slope.	Slight.
Barnes	Slight	Slight	Severe: slope.	Slight.
BgD:				
Buse	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Barnes	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
BhC:				
Buse	Moderate: large stones.	Moderate: large stones.	Severe: large stones, slope.	Severe: large stones.
Barnes	Moderate: large stones.	Moderate: large stones.	Severe: large stones.	Slight.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
BhE:				
Buse	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: large stones.
Barnes	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: slope.
BkE:				
Buse	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lamoure	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
BoE:				
Buse	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Langhei	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
BpD:				
Buse	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Poinsett	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
BrD:				
Buse	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: large stones.
Poinsett	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
BsC:				
Buse	Slight	Slight	Severe: slope.	Slight.
Singsaas	Slight	Slight	Severe: slope.	Slight.
BxE:				
Buse	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Sioux	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.
Ca: Castlewood	Severe: flooding, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness.	Severe: wetness, too clayey.
Ch: Chaska	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Cm: Clamo	Severe: flooding, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness.	Severe: wetness, too clayey.
Co:				
Cubden	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Badger	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Ct:				
Cubden	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Tonka	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
DaB: Darnen	Slight	Slight	Moderate: slope.	Slight.
DcA: Davis	Severe: wetness.	Slight	Moderate: wetness.	Slight.
DcB: Davis	Slight	Slight	Moderate: slope.	Slight.
Dm: Dimo	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.
Dn: Divide	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.
DoB: Doland	Slight	Slight	Moderate: slope.	Slight.
DsA:				
Doland	Slight	Slight	Slight	Slight.
Svea	Severe: wetness.	Slight	Severe: wetness.	Slight.
EaB:				
Egan	Slight	Slight	Moderate: slope.	Slight.
Ethan	Slight	Slight	Moderate: slope.	Slight.
EeB:				
Egan	Slight	Slight	Moderate: slope.	Slight.
Wentworth	Slight	Slight	Moderate: slope.	Slight.
Trent	Severe: wetness.	Slight	Moderate: wetness.	Slight.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
EgA:				
Egeland	Slight	Slight	Slight	Slight.
Embden	Slight	Slight	Slight	Slight.
EgB:				
Egeland	Slight	Slight	Moderate: slope.	Slight.
Embden	Slight	Slight	Moderate: slope.	Slight.
EnA: Enet	Severe: flooding.	Slight	Slight	Slight.
EsA: Estelline	Slight	Slight	Slight	Slight.
EsB: Estelline	Slight	Slight	Moderate: slope.	Slight.
EtB:				
Estelline	Slight	Slight	Moderate: slope.	Slight.
Sioux	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
EvD:				
Ethan	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Clarno	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
EwC:				
Ethan	Slight	Slight	Severe: slope.	Slight.
Egan	Slight	Slight	Severe: slope.	Slight.
Fa: Fairdale	Severe: flooding.	Moderate: flooding.	Slight	Moderate: flooding.
Fb: Fordtown	Severe: flooding.	Slight	Slight	Slight.
Fc:				
Fordtown	Severe: flooding.	Slight	Slight	Slight.
Spottswood	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.
FdA: Fordville	Slight	Slight	Slight	Slight.
FrB:				
Fordville	Slight	Slight	Moderate: slope.	Slight.
Renshaw	Slight	Slight	Moderate: slope.	Slight.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Gs: Goldsmith	Severe: wetness.	Slight	Moderate: wetness.	Slight.
Hb:				
Hamerly	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.
Badger	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Hc:				
Hamerly	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.
Cavour	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
Badger	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
HeA: Hetland	Slight	Slight	Slight	Slight.
HeB: Hetland	Slight	Slight	Moderate: slope.	Slight.
KrA:				
Kranzburg	Slight	Slight	Slight	Slight.
Brookings	Severe: wetness.	Slight	Moderate: wetness.	Slight.
KrB:				
Kranzburg	Slight	Slight	Moderate: slope.	Slight.
Brookings	Severe: wetness.	Slight	Moderate: wetness.	Slight.
La: La Prairie	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Lc: La Prairie	Severe: flooding.	Slight	Slight	Slight.
Ld: LaDelle	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Le: Lamo	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
Lk: Lamoure	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Lm:				
Lamoure	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Lm:				
Rauville	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
LnB:				
Lanona	Slight	Slight	Moderate: slope.	Slight.
Swenoda	Slight	Slight	Moderate: slope.	Slight.
Lo: Lowe	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Lr:				
Lowe	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ludden	Severe: flooding, ponding, too clayey.	Severe: ponding, too clayey.	Severe: too clayey, ponding, flooding.	Severe: ponding, too clayey.
Ls: Ludden	Severe: flooding, ponding, too clayey.	Severe: ponding, too clayey.	Severe: too clayey, ponding, flooding.	Severe: ponding, too clayey.
Lu:				
Ludden, saline	Severe: flooding, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness, flooding.	Severe: wetness, too clayey.
Ludden	Severe: flooding, ponding, too clayey.	Severe: ponding, too clayey.	Severe: too clayey, ponding, flooding.	Severe: ponding, too clayey.
M-W. Miscellaneous water				
MaB:				
Maddock	Slight	Slight	Moderate: slope.	Slight.
Egeland	Slight	Slight	Moderate: slope.	Slight.
MaC:				
Maddock	Slight	Slight	Severe: slope.	Slight.
Egeland	Slight	Slight	Severe: slope.	Slight.
MeA:				
Maddock	Slight	Slight	Slight	Slight.
Embden	Slight	Slight	Slight	Slight.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Mr: Marysland	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Mt:				
McIntosh	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.
Badger	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Mu:				
McIntosh	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.
Lamoure	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Mw: Minnewaukan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Mz:				
Moritz	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.
Lamoure	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Od: Oldham	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Og: Orthents	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Or: Orthents	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight.
Pa: Parnell	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
PbB:				
Poinsett	Slight	Slight	Moderate: slope.	Slight.
Buse	Slight	Slight	Moderate: slope, small stones.	Slight.
Waubay	Severe: wetness.	Slight	Moderate: wetness.	Slight.
PbC:				
Poinsett	Slight	Slight	Severe: slope.	Slight.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
PbC:				
Buse	Slight	Slight	Severe: slope.	Slight.
Waubay	Slight	Slight	Moderate: slope.	Slight.
PwA:				
Poinsett	Slight	Slight	Slight	Slight.
Waubay	Severe: wetness.	Slight	Moderate: wetness.	Slight.
PwB:				
Poinsett	Slight	Slight	Moderate: slope.	Slight.
Waubay	Severe: wetness.	Slight	Moderate: wetness.	Slight.
Ra: Rauville	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Rp: Rauville	Severe: flooding, ponding.	Severe: ponding, wetness.	Severe: flooding, ponding, wetness.	Severe: ponding, wetness.
RsB:				
Renshaw	Slight	Slight	Moderate: slope.	Slight.
Sioux	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
RsC:				
Renshaw	Slight	Slight	Severe: slope.	Slight.
Sioux	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Slight.
Rw: Renwash	Severe: flooding.	Slight	Slight	Slight.
SbB:				
Singsaas	Slight	Slight	Moderate: slope.	Slight.
Buse	Slight	Slight	Moderate: slope, small stones.	Slight.
ScA:				
Singsaas	Slight	Slight	Slight	Slight.
Waubay	Severe: wetness.	Slight	Moderate: wetness.	Slight.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
ScB:				
Singsaas	Slight	Slight	Moderate: slope.	Slight.
Waubay	Severe: wetness.	Slight	Moderate: wetness.	Slight.
ShD:				
Sioux	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
Renshaw	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
ShE:				
Sioux	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Renshaw	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
So Southam	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Sp Spottswood	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.
SrA Strayhoss	Slight	Slight	Slight	Slight.
SrB Strayhoss	Slight	Slight	Moderate: slope.	Slight.
StB:				
Strayhoss	Slight	Slight	Moderate: slope.	Slight.
Maddock	Slight	Slight	Moderate: slope.	Slight.
SvA Svea	Severe: wetness.	Slight	Severe: wetness.	Slight.
SwA:				
Swenoda	Slight	Slight	Slight	Slight.
Lanona	Slight	Slight	Slight	Slight.
To Tonka	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Tr Trent	Severe: wetness.	Slight	Moderate: wetness.	Slight.
VaA:				
Venagro	Slight	Slight	Slight	Slight.
Svea	Severe: wetness.	Slight	Severe: wetness.	Slight.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
VaB:				
Venagro	Slight	Slight	Moderate: slope.	Slight.
Svea	Severe: wetness.	Slight	Severe: wetness.	Slight.
VbA:				
Vienna	Slight	Slight	Slight	Slight.
Brookings	Severe: wetness.	Slight	Moderate: wetness.	Slight.
VbB:				
Vienna	Slight	Slight	Moderate: slope.	Slight.
Brookings	Severe: wetness.	Slight	Moderate: wetness.	Slight.
VnB:				
Vienna	Slight	Slight	Moderate: slope.	Slight.
Buse	Slight	Slight	Moderate: slope, small stones.	Slight.
VnC:				
Vienna	Slight	Slight	Severe: slope.	Slight.
Buse	Slight	Slight	Severe: slope.	Slight.
W. Water				
Wa:				
Wakonda	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight.
Chancellor	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Wb Waubay	Severe: wetness.	Slight	Moderate: wetness.	Slight.
WeA:				
Wentworth	Slight	Slight	Slight	Slight.
Trent	Severe: wetness.	Slight	Moderate: wetness.	Slight.
Wo Worthing	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

Table 11.--Wildlife Habitat

(See text for definitions of terms used in this table. Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herba-ceous plants	Planted woody plants	Native decid-uous trees	Native conif-erous plants	Native shrubs	Wetland plants	Shallow water areas
Aa----------------- Allivar	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Ar----------------- Arlo	Poor	Poor	Fair	Good	Poor	Poor	Fair	Good	Fair.
AvB---------------- Arvilla	Poor	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.
Ba----------------- Badger	Good	Good	Good	Good	Fair	Poor	Fair	Fair	Fair.
BbA, BbB----------- Barnes	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
BcB:									
Barnes------------	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Buse--------------	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
BeA, BeB----------- Brandt	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Bf----------------- Brookings	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
BgC:									
Buse--------------	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Barnes------------	Fair	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
BgD:									
Buse--------------	Very poor.	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Barnes------------	Poor	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
BhC, BhE:									
Buse--------------	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Barnes------------	Very poor.	Very poor.	Fair	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.
BkE:									
Buse--------------	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.
Lamoure-----------	Very poor.	Very poor.	Fair	Good	Poor	Poor	Fair	Fair	Fair.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
BoE:									
Buse	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Langhei	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
BpD:									
Buse	Very poor.	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Poinsett	Very poor.	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
BrD:									
Buse	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Poinsett	Very poor.	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
BsC:									
Buse	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Singsaas	Fair	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
BxE:									
Buse	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Sioux	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Ca Castlewood	Poor	Poor	Poor	Very poor.	Fair	Poor	Fair	Fair	Fair.
Ch Chaska	Very poor.	Very poor.	Fair	Very poor.	Fair	Poor	Fair	Fair	Fair.
Cm Clamo	Poor	Poor	Good	Very poor.	Fair	Poor	Fair	Fair	Fair.
Co:									
Cubden	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Fair.
Badger	Good	Good	Good	Good	Good	Poor	Fair	Fair	Fair.
Ct:									
Cubden	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Poor.
Tonka	Poor	Poor	Fair	Very poor.	Fair	Very poor.	Poor	Fair	Fair.
DaB Darnen	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
DcA Davis	Good	Good	Good	Good	Fair	Fair	Good	Very poor.	Very poor.
DcB Davis	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
Dm: Dimo	Fair	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
Dn: Divide	Fair	Fair	Fair	Good	Poor	Very poor.	Fair	Very poor.	Very poor.
DoB: Doland	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
DsA:									
Doland	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Svea	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
EaB:									
Egan	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Ethan	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
EeB:									
Egan	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Wentworth	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Trent	Good	Good	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.
EgA:									
Egeland	Fair	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Embden	Fair	Fair	Good	Good	Fair	Poor	Fair	Very poor.	Poor.
EgB:									
Egeland	Fair	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Embden	Fair	Fair	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
EnA: Enet	Good	Fair	Good	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
EsA: Estelline	Good	Fair	Good	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
EsB: Estelline	Good	Fair	Good	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
EtB:									
Estelline	Good	Fair	Good	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
Sioux	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
EvD:									
Ethan	Very poor.	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Clarno	Poor	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
EwC:									
Ethan	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Egan	Fair	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Fa Fairdale	Very poor.	Very poor.	Fair	Good	Fair	Poor	Good	Fair	Fair.
Fb Fordtown	Good	Fair	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Fc:									
Fordtown	Good	Fair	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Spottswood	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
FdA Fordville	Good	Fair	Good	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
FrB:									
Fordville	Good	Fair	Good	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
Renshaw	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
Gs Goldsmith	Good	Good	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.
Hb:									
Hamerly	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Poor.
Badger	Good	Good	Good	Good	Fair	Poor	Fair	Fair	Fair.
Hc:									
Hamerly	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Poor.
Cavour	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.
Badger	Good	Good	Good	Good	Fair	Poor	Fair	Fair	Fair.
HeA Hetland	Good	Good	Good	Good	Fair	Very poor.	Poor	Very poor.	Very poor.
HeB Hetland	Good	Good	Good	Good	Fair	Very poor.	Fair	Very poor.	Very poor.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
KrA:									
Kranzburg	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Brookings	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
KrB:									
Kranzburg	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Brookings	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
La. La Prairie	Good	Good	Good	Good	Fair	Poor	Good	Poor	Poor.
Lc. La Prairie	Good	Good	Good	Good	Fair	Poor	Good	Very poor.	Very poor.
Ld. LaDelle	Good	Good	Good	Good	Fair	Poor	Good	Very poor.	Very poor.
Le. Lamo	Good	Good	Fair	Good	Poor	Poor	Fair	Poor	Poor.
Lk. Lamoure	Fair	Good	Fair	Good	Poor	Poor	Fair	Poor	Poor.
Lm:									
Lamoure	Very poor.	Very poor.	Fair	Good	Poor	Poor	Fair	Fair	Fair.
Rauville	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Fair	Fair	Fair.
LnB:									
Lanona	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Very poor.	Very poor.
Swenoda	Good	Fair	Fair	Fair	Fair	Poor	Fair	Very poor.	Very poor.
Lo. Lowe	Poor	Good	Fair	Good	Fair	Poor	Fair	Fair	Fair.
Lr:									
Lowe	Poor	Good	Fair	Good	Fair	Poor	Fair	Fair	Fair.
Ludden	Poor	Poor	Poor	Good	Poor	Poor	Fair	Fair	Fair.
Ls. Ludden	Poor	Poor	Poor	Good	Poor	Poor	Fair	Fair	Fair.
Lu:									
Ludden, saline	Poor	Poor	Fair	Very poor.	Poor	Poor	Poor	Fair	Fair.
Ludden	Poor	Poor	Poor	Fair	Poor	Poor	Fair	Fair	Fair.
M-W. Miscellaneous water									

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Native herba- ceous plants	Planted woody plants	Native decid- uous trees	Native conif- erous plants	Native shrubs	Wetland plants	Shallow water areas
MaB:									
Maddock-----------	Fair	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Egeland-----------	Fair	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
MaC:									
Maddock-----------	Poor	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Egeland-----------	Poor	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
MeA:									
Maddock-----------	Fair	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Embden------------	Good	Fair	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
Mr----------------- Marysland	Poor	Poor	Fair	Very poor.	Poor	Poor	Fair	Good	Fair.
Mt:									
McIntosh----------	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Poor.
Badger------------	Good	Good	Good	Good	Poor	Poor	Fair	Fair	Fair.
Mu:									
McIntosh----------	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Poor.
Lamoure-----------	Poor	Poor	Fair	Good	Fair	Poor	Fair	Fair	Fair.
Mw----------------- Minnewaukan	Poor	Good	Fair	Good	Poor	Very poor.	Fair	Fair	Fair.
Mz:									
Moritz------------	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Poor.
Lamoure-----------	Poor	Poor	Fair	Good	Poor	Poor	Fair	Fair	Fair.
Od----------------- Oldham	Very poor.	Poor	Poor	Very poor.	Poor	Very poor.	Poor	Good	Good.
Og----------------- Orthents	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Or----------------- Orthents	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.
Pa----------------- Parnell	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Good	Good.
PbB:									
Poinsett----------	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Buse--------------	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Waubay------------	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
PbC:									
Poinsett----------	Fair	Good	Good	Good	Poor	Very poor.	Fair	Very poor.	Very poor.
Buse--------------	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Waubay------------	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
PwA, PwB:									
Poinsett----------	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Waubay------------	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
Ra----------------- Rauville	Very poor.	Poor	Poor	Very poor.	Poor	Very poor.	Fair	Fair	Fair.
Rp----------------- Rauville	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good.
RsB, RsC:									
Renshaw-----------	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
Sioux-------------	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Rw----------------- Renwash	Fair	Fair	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
SbB:									
Singsaas----------	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Buse--------------	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
ScA:									
Singsaas----------	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Waubay------------	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
ScB:									
Singsaas----------	Good	Good	Good	Good	Fair	Very poor.	Very poor.	Very poor.	Very poor.
Waubay------------	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
ShD, ShE:									
Sioux-------------	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Renshaw-----------	Very poor.	Poor	Poor	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.
So----------------- Southam	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Native herba- ceous plants	Planted woody plants	Native decid- uous trees	Native conif- erous plants	Native shrubs	Wetland plants	Shallow water areas
Sp----------------- Spottswood	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Poor.
SrA, SrB----------- Strayhoss	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
StB:									
Strayhoss---------	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Maddock-----------	Fair	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
SvA---------------- Svea	Good	Good	Good	Good	Fair	Poor	Fair	Poor	Fair.
SwA:									
Swenoda-----------	Good	Fair	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
Lanona------------	Fair	Fair	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
To----------------- Tonka	Poor	Poor	Fair	Very poor.	Fair	Very poor.	Poor	Fair	Fair.
Tr----------------- Trent	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
VaA, VaB:									
Venagro-----------	Good	Good	Good	Good	Fair	Very poor.	Poor	Very poor.	Very poor.
Svea--------------	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
VbA, VbB:									
Vienna------------	Good	Good	Good	Good	Fair	Very poor.	Poor	Very poor.	Very poor.
Brookings---------	Good	Good	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.
VnB:									
Vienna------------	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Buse--------------	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
VnC:									
Vienna------------	Fair	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Buse--------------	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
W. Water									

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
Wa:									
Wakonda-----------	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Poor.
Chancellor--------	Good	Good	Good	Good	Fair	Poor	Fair	Fair	Fair.
Wb----------------- Waubay	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
WeA:									
Wentworth---------	Good	Good	Good	Good	Fair	Very poor.	Poor	Very poor.	Very poor.
Trent-------------	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
Wo----------------- Worthing	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Good	Good.

Table 12.--Building Site Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Aa: Allivar	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Ar: Arlo	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.
AvB: Arvilla	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Ba: Badger	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
BbA: Barnes	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
BbB: Barnes	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
BcB:					
Barnes	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Buse	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
BeA: Brandt	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
BeB: Brandt	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Bf: Brookings	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
BgC:					
Buse	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Barnes	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
BgD:					
Buse	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.
Barnes	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
BhC:					
Buse	Moderate: large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, slope, large stones.	Moderate: shrink-swell, low strength.
Barnes	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.
BhE:					
Buse	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Barnes	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
BkE:					
Buse	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lamoure	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
BoE:					
Buse	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Langhei	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
BpD:					
Buse	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.
Poinsett	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.
BrD:					
Buse	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Poinsett	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
BsC:					
Buse	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Singsaas	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
BxE:					
Buse	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sioux	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ca Castlewood	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Ch Chaska	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.
Cm Clamo	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Co:					
Cubden	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.
Badger	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Ct:					
Cubden	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.
Tonka	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
DaB Darnen	Slight	Slight	Moderate: shrink-swell.	Moderate: slope.	Moderate: frost action.
DcA Davis	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.
DcB Davis	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Dm: Dimo	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action.
Dn: Divide	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.
DoB: Doland	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
DsA:					
Doland	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Svea	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.
EaB:					
Egan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Ethan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
EeB:					
Egan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Wentworth	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Trent	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
EgA:					
Egeland	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Embden	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.
EgB:					
Egeland	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Embden	Severe: cutbanks cave.	Slight	Moderate: wetness.	Moderate: slope.	Moderate: frost action.
EnA: Enet	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
EsA: Estelline	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
EsB: Estelline	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.
EtB:					
Estelline	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.
Sioux	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
EvD:					
Ethan	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
Clarno	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
EwC:					
Ethan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Egan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Fa: Fairdale	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Fb: Fordtown	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding.
Fc:					
Fordtown	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding.
Spottswood	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.
FdA: Fordville	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
FrB:					
Fordville	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Renshaw	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Gs: Goldsmith	Severe: cutbanks cave.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Hb:					
Hamerly	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.
Badger	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Hc:					
Hamerly	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.
Cavour	Moderate: too clayey, wetness.	Severe: shrink-swell.	Moderate: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Badger	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
HeA, HeB Hetland	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
KrA:					
Kranzburg	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Brookings	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
KrB:					
Kranzburg	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Brookings	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
La La Prairie	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.
Lc La Prairie	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.
Ld LaDelle	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.
Le Lamo	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Lk: Lamoure	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
Lm:					
Lamoure	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
Rauville	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
LnB:					
Lanona	Slight	Slight	Moderate: shrink-swell.	Moderate: slope.	Moderate: frost action.
Swenoda	Moderate: wetness.	Slight	Moderate: wetness, shrink-swell.	Slight	Moderate: frost action.
Lo: Lowe	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
Lr:					
Lowe	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
Ludden	Severe: cutbanks cave, ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Ls: Ludden	Severe: cutbanks cave, ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Lu:					
Ludden, saline	Severe: cutbanks cave, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Ludden	Severe: cutbanks cave, ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
M-W. Miscellaneous water					

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
MaB, MaC:					
Maddock	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Egeland	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
MeA:					
Maddock	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Embden	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.
Mr: Marysland	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.
Mt:					
McIntosh	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.
Badger	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Mu:					
McIntosh	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.
Lamoure	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
Mw: Minnewaukan	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding.
Mz:					
Moritz	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action.
Lamoure	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
Od: Oldham	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Og: Orthents	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Or---------------------- Orthents	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Pa---------------------- Parnell	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
PbB:					
Poinsett----------------	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Buse--------------------	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Waubay------------------	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.
PbC:					
Poinsett----------------	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Buse--------------------	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Waubay------------------	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
PwA:					
Poinsett----------------	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Waubay------------------	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.
PwB:					
Poinsett----------------	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Waubay------------------	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.
Ra---------------------- Rauville	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Rp: Rauville	Severe: cutbanks cave, wetness, ponding.	Severe: flooding, ponding.	Severe: flooding, wetness.	Severe: flooding, ponding.	Severe: low strength, flooding, ponding, frost action.
RsB, RsC:					
Renshaw	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Sioux	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Rw: Renwash	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
SbB:					
Singsaas	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Buse	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
ScA:					
Singsaas	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Waubay	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.
ScB:					
Singsaas	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Waubay	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.
ShD:					
Sioux	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Renshaw	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
ShE:					
Sioux	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Renshaw	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
So: Southam	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Sp: Spottswood	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.
SrA: Strayhoss	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength, frost action.
SrB: Strayhoss	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
StB:					
Strayhoss	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Maddock	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
SvA: Svea	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.
SwA:					
Swenoda	Moderate: wetness.	Slight	Moderate: wetness, shrink-swell.	Slight	Moderate: frost action.
Lanona	Slight	Slight	Moderate: shrink-swell.	Slight	Moderate: frost action.
To: Tonka	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Tr: Trent	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
VaA:					
Venagro	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Svea	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.
VaB:					
Venagro	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Svea	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
VbA:					
Vienna	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Brookings	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
VbB:					
Vienna	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Brookings	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
VnB, VnC:					
Vienna	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Buse	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
W. Water					
Wa:					
Wakonda	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.
Chancellor	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Wb: Waubay	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.
WeA:					
Wentworth	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Trent	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
Wo: Worthing	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.

Table 13.--Sanitary Facilities

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Aa: Allivar	Severe: wetness, poor filter.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Ar: Arlo	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, small stones.
AvB: Arvilla	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Ba: Badger	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
BbA: Barnes	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
BbB: Barnes	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
BcB:					
Barnes	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Buse	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
BeA, BeB: Brandt	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey, thin layer.
Bf: Brookings	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
BgC:					
Buse	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Barnes	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
BgD:					
Buse	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Barnes	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BhC:					
Buse	Severe: percs slowly.	Severe: large stones.	Severe: large stones.	Slight	Fair: too clayey, large stones.
Barnes	Severe: percs slowly.	Moderate: seepage, slope, large stones.	Severe: large stones.	Slight	Fair: too clayey, large stones.
BhE:					
Buse	Severe: percs slowly, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: slope.
Barnes	Severe: percs slowly, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: slope.
BkE:					
Buse	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Lamoure	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
BoE:					
Buse	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Langhei	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
BpD:					
Buse	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Poinsett	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
BrD:					
Buse	Severe: percs slowly, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: slope.
Poinsett	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
BsC:					
Buse	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Singsaas	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BxE:					
Buse	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Sioux	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Ca: Castlewood	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Ch: Chaska	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: thin layer.
Cm: Clamo	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Co:					
Cubden	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
Badger	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Ct:					
Cubden	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
Tonka	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
DaB: Darnen	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
DcA: Davis	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
DcB: Davis	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Dm: Dimo	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, small stones.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Dn: Divide	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, small stones.
DoB: Doland	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
DsA:					
Doland	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Svea	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
EaB:					
Egan	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
Ethan	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
EeB:					
Egan	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
Wentworth	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Trent	Severe: wetness.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
EgA, EgB:					
Egeland	Slight	Severe: seepage.	Slight	Severe: seepage.	Poor: thin layer.
Embden	Severe: wetness.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Fair: too sandy.
EnA: Enet	Severe: wetness, poor filter.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
EsA, EsB: Estelline	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
EtB:					
Estelline	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
EtB:					
Sioux	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
EvD:					
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Clarno	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
EwC:					
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Egan	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
Fa: Fairdale	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Fb: Fordtown	Severe: wetness, poor filter.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Fc:					
Fordtown	Severe: wetness, poor filter.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Spottswood	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, small stones.
FdA: Fordville	Severe: poor filter.	Severe: seepage.	Severe: seepage. too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
FrB:					
Fordville	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Renshaw	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Gs: Goldsmith	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Hb:					
Hamerly	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Badger	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Hc:					
Hamerly	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Cavour	Severe: wetness, percs slowly.	Slight	Severe: wetness, excess sodium.	Moderate: wetness.	Poor: hard to pack, excess sodium.
Badger	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
HeA Hetland	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Poor: hard to pack.
HeB Hetland	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
KrA:					
Kranzburg	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Brookings	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
KrB:					
Kranzburg	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Brookings	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
La La Prairie	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Fair: too clayey.
Lc La Prairie	Severe: wetness.	Moderate: seepage, wetness.	Severe: wetness.	Moderate: flooding, wetness.	Fair: too clayey.
Ld LaDelle	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Poor: hard to pack.
Le Lamo	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Lk------------------ Lamoure	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Lm:					
Lamoure-------------	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Rauville------------	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
LnB:					
Lanona--------------	Severe: percs slowly.	Severe: seepage.	Moderate: too clayey.	Severe: seepage.	Fair: too clayey.
Swenoda-------------	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Moderate: wetness, too clayey.	Severe: seepage.	Fair: too clayey, wetness.
Lo------------------ Lowe	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Lr:					
Lowe----------------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Ludden--------------	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, ponding.
Ls------------------ Ludden	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, ponding.
Lu:					
Ludden, saline------	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Ludden--------------	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, ponding.
M-W: Miscellaneous water					
MaB:					
Maddock-------------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Egeland-------------	Slight--------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MaC:					
Maddock	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Egeland	Slight	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
MeA:					
Maddock	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Embden	Severe: wetness.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Fair: too sandy.
Mr Marysland	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
Mt:					
McIntosh	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Badger	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Mu:					
McIntosh	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Lamoure	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Mw Minnewaukan	Severe: flooding, ponding, poor filter.	Severe: seepage, flooding, ponding.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: seepage, too sandy, ponding.
Mz:					
Moritz	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Lamoure	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Od Oldham	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Og: Orthents	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Or: Orthents	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Pa: Parnell	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
PbB:					
Poinsett	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Buse	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Waubay	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.
PbC:					
Poinsett	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Buse	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Waubay	Severe: wetness.	Moderate: seepage, slope, wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
PwA:					
Poinsett	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Waubay	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.
PwB:					
Poinsett	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Waubay	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.
Ra: Rauville	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Rp: Rauville	Severe: flooding, wetness, ponding, percs slowly.	Severe: seepage, flooding, ponding, wetness.	Severe: flooding, seepage, ponding, wetness.	Severe: flooding, ponding, wetness.	Poor: too clayey, ponding, hard to pack.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
RsB:					
Renshaw	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Sioux	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
RsC:					
Renshaw	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Sioux	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Rw Renwash	Severe: wetness, poor filter.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
SbB:					
Singsaas	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Buse	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
ScA:					
Singsaas	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Waubay	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.
ScB:					
Singsaas	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Waubay	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.
ShD:					
Sioux	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Renshaw	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
ShE:					
Sioux	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Renshaw	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
So Southam	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Sp Spottswood	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, small stones.
SrA, SrB Strayhoss	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
StB:					
Strayhoss	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Maddock	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
SvA Svea	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
SwA:					
Swenoda	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Moderate: wetness, too clayey.	Severe: seepage.	Fair: too clayey, wetness.
Lanona	Severe: percs slowly.	Severe: seepage.	Moderate: too clayey.	Severe: seepage.	Fair: too clayey.
To Tonka	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Tr Trent	Severe: wetness.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
VaA:					
Venagro	Severe: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
Svea	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
VaB:					
Venagro	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Svea	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
VbA:					
Vienna	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Brookings	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
VbB:					
Vienna	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Brookings	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
VnB:					
Vienna	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Buse	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
VnC:					
Vienna	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Buse	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
W. Water					
Wa:					
Wakonda	Severe: wetness.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
Chancellor	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Wb Waubay	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.
WeA:					
Wentworth	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Trent	Severe: wetness.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Fair: too clayey.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Wo---------------------- Worthing	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.

Table 14.--Construction Materials

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Aa Allivar	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Ar Arlo	Poor: wetness.	Probable	Probable	Poor: area reclaim, wetness.
AvB Arvilla	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Ba Badger	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
BbA, BbB Barnes	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
BcB:				
Barnes	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
BeA, BeB Brandt	Good	Probable	Probable	Poor: area reclaim.
Bf Brookings	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
BgC:				
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Barnes	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
BgD:				
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Barnes	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
BhC:				
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
Barnes	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
BhE:				
Buse	Fair: shrink-swell, low strength. slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim, slope.
Barnes	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
BkE:				
Buse	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Lamoure	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
BoE:				
Buse	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Langhei	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
BpD:				
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Poinsett	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
BrD:				
Buse	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim, slope.
Poinsett	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
BsC:				
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Singsaas	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
BxE:				
Buse	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Sioux	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ca: Castlewood	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Ch: Chaska	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, thin layer.
Cm: Clamo	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Co:				
Cubden	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Badger	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Ct:				
Cubden	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Tonka	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
DaB: Darnen	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
DcA, DcB: Davis	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Dm: Dimo	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
Dn: Divide	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
DoB: Doland	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
DsA:				
Doland	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Svea	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
EaB:				
Egan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
EeB:				
Egan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Wentworth	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Trent	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
EgA, EgB:				
Egeland	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Embden	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
EnA Enet	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
EsA, EsB Estelline	Good	Probable	Probable	Poor: area reclaim.
EtB:				
Estelline	Good	Probable	Probable	Poor: area reclaim.
Sioux	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
EvD:				
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Clarno	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
EwC:				
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Egan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Fa Fairdale	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Fb Fordtown	Good	Probable	Probable	Poor: small stones, area reclaim.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Fc:				
Fordtown	Good	Probable	Probable	Poor: small stones, area reclaim.
Spottswood	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
FdA: Fordville	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
FrB:				
Fordville	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Renshaw	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Gs: Goldsmith	Good	Probable	Probable	Fair: area reclaim.
Hb:				
Hamerly	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Badger	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Hc:				
Hamerly	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Cavour	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Badger	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
HeA, HeB: Hetland	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
KrA, KrB:				
Kranzburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Brookings	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
La, Lc: La Prairie	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Ld: LaDelle	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Le: Lamo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Lk: Lamoure	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Lm:				
Lamoure	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Rauville	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
LnB:				
Lanona	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Swenoda	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Lo: Lowe	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Lr:				
Lowe	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ludden	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Ls: Ludden	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Lu:				
Ludden, saline	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Ludden	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
M-W. Miscellaneous water				

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MaB, MaC:				
Maddock	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Egeland	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
MeA:				
Maddock	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Embden	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Mr: Marysland	Poor: wetness.	Probable	Probable	Poor: wetness.
Mt:				
McIntosh	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Badger	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Mu:				
McIntosh	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Lamoure	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Mw: Minnewaukan	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, small stones, wetness.
Mz:				
Moritz	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Lamoure	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Od: Oldham	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Og: Orthents	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Or: Orthents	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Pa: Parnell	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
PbB, PbC:				
Poinsett	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Waubay	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
PwA, PwB:				
Poinsett	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Waubay	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ra: Rauville	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Rp: Rauville	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer, wetness.
RsB, RsC:				
Renshaw	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Sioux	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Rw: Renwash	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
SbB:				
Singsaas	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
ScA, ScB:				
Singsaas	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Waubay	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
ShD:				
Sioux	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ShD:				
Renshaw	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
ShE:				
Sioux	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Renshaw	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
So: Southam	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Sp: Spottswood	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
SrA, SrB: Strayhoss	Good	Probable	Improbable: too sandy.	Fair: thin layer.
StB:				
Strayhoss	Good	Probable	Improbable: too sandy.	Fair: thin layer.
Maddock	Good	Probable	Improbable: too sandy.	Poor: too sandy.
SvA: Svea	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
SwA:				
Swenoda	Fair: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Lanona	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
To: Tonka	Poor: low strength. wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Tr: Trent	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
VaA, VaB:				
Venagro	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Svea	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
VbA, VbB:				
Vienna	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Brookings	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
VnB, VnC:				
Vienna	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
W. Water				
Wa:				
Wakonda	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Chancellor	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Wb Waubay	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
WeA:				
Wentworth	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Trent	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Wo Worthing	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

Table 15.--Water Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Aa: Allivar	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Ar: Arlo	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, frost action, cutbanks cave.	Wetness, rooting depth, flooding.	Wetness, too sandy.	Wetness, rooting depth.
AvB: Arvilla	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Ba: Badger	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
BbA: Barnes	Slight	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
BbB: Barnes	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
BcB:						
Barnes	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Buse	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
BeA: Brandt	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
BeB: Brandt	Severe: seepage.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Bf: Brookings	Moderate: seepage.	Slight	Deep to water	Favorable	Erodes easily	Erodes easily.
BgC:						
Buse	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Barnes	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
BgD:						
Buse	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Barnes	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
BhC:						
Buse	Moderate: slope.	Severe: large stones.	Deep to water	Slope, large stones, excess salt.	Large stones	Large stones.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
BhC:						
Barnes	Moderate: slope.	Severe: piping.	Deep to water	Slope	Large stones, erodes easily.	Large stones, erodes easily.
BhE:						
Buse	Severe: slope.	Severe: large stones.	Deep to water	Slope, large stones, excess salt.	Slope, large stones.	Large stones, slope.
Barnes	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
BkE:						
Buse	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Lamoure	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
BoE:						
Buse	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Langhei	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
BpD:						
Buse	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Poinsett	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
BrD:						
Buse	Severe: slope.	Severe: large stones.	Deep to water	Slope, large stones, excess salt.	Slope, large stones.	Large stones, slope.
Poinsett	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
BsC:						
Buse	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Singsaas	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
BxE:						
Buse	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Sioux	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.
Ca Castlewood	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ch: Chaska	Severe: seepage.	Severe: piping, wetness.	Flooding, frost action, cutbanks cave.	Wetness, flooding.	Wetness	Favorable.
Cm: Clamo	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, slow intake, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Co:						
Cubden	Moderate: seepage.	Severe: wetness.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
Badger	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Ct:						
Cubden	Moderate: seepage.	Severe: wetness.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
Tonka	Moderate: seepage.	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
DaB: Darnen	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Favorable	Favorable.
DcA: Davis	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
DcB: Davis	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Favorable	Favorable.
Dm: Dimo	Severe: seepage.	Severe: seepage, wetness.	Flooding, frost action, cutbanks cave.	Wetness, rooting depth, flooding.	Wetness, too sandy.	Rooting depth.
Dn: Divide	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, cutbanks cave.	Wetness, flooding.	Wetness, too sandy.	Favorable.
DoB: Doland	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Favorable	Favorable.
DsA:						
Doland	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.
Svea	Moderate: seepage.	Severe: piping.	Deep to water	Wetness	Erodes easily	Erodes easily.
EaB:						
Egan	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Slope	Erodes easily	Erodes easily.
Ethan	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
EeB:						
Egan	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Slope	Erodes easily	Erodes easily.
Wentworth	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Trent	Moderate: seepage.	Moderate: piping.	Deep to water	Wetness	Erodes easily	Erodes easily.
EgA:						
Egeland	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty	Soil blowing	Droughty.
Embden	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
EgB:						
Egeland	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Soil blowing	Droughty.
Embden	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, soil blowing.	Soil blowing	Favorable.
EnA Enet	Severe: seepage.	Severe: seepage.	Deep to water	Favorable	Too sandy	Favorable.
EsA Estelline	Severe: seepage.	Severe: seepage.	Deep to water	Favorable	Erodes easily, too sandy.	Erodes easily.
EsB Estelline	Severe: seepage.	Severe: seepage.	Deep to water	Slope	Erodes easily, too sandy.	Erodes easily.
EtB:						
Estelline	Severe: seepage.	Severe: seepage.	Deep to water	Slope	Erodes easily, too sandy.	Erodes easily.
Sioux	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy	Droughty.
EvD:						
Ethan	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Clarno	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
EwC:						
Ethan	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Egan	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Slope	Erodes easily	Erodes easily.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Fa------- Fairdale	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Favorable------	Favorable.
Fb------- Fordtown	Severe: seepage.	Severe: seepage, piping.	Deep to water	Rooting depth	Too sandy------	Rooting depth.
Fc:						
Fordtown-------	Severe: seepage.	Severe: seepage, piping.	Deep to water	Rooting depth	Too sandy------	Rooting depth.
Spottswood-------	Severe: seepage.	Severe: seepage, wetness.	Flooding, cutbanks cave.	Wetness, flooding.	Wetness, too sandy.	Favorable.
FdA------- Fordville	Severe: seepage.	Severe: seepage.	Deep to water	Rooting depth	Too sandy------	Rooting depth.
FrB:						
Fordville-------	Severe: seepage.	Severe: seepage.	Deep to water	Slope, rooting depth.	Too sandy------	Rooting depth.
Renshaw-------	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy------	Droughty.
Gs------- Goldsmith	Severe: seepage.	Moderate: piping, wetness.	Deep to water	Favorable------	Erodes easily	Erodes easily.
Hb:						
Hamerly-------	Moderate: seepage.	Severe: piping, wetness.	Frost action---	Wetness--------	Erodes easily, wetness.	Erodes easily.
Badger-------	Slight--------	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Hc:						
Hamerly-------	Moderate: seepage.	Severe: piping, wetness.	Frost action---	Wetness--------	Erodes easily, wetness.	Erodes easily.
Cavour-------	Slight--------	Severe: excess sodium.	Deep to water	Percs slowly, rooting depth.	Erodes easily, percs slowly.	Excess sodium, erodes easily, rooting depth.
Badger-------	Slight--------	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
HeA------- Hetland	Slight--------	Moderate: piping, hard to pack.	Deep to water	Percs slowly---	Erodes easily, percs slowly.	Erodes easily, percs slowly.
HeB------- Hetland	Moderate: slope.	Moderate: piping, hard to pack.	Deep to water	Slope, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
KrA:						
Kranzburg	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Brookings	Moderate: seepage.	Slight	Deep to water	Favorable	Erodes easily	Erodes easily.
KrB:						
Kranzburg	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Brookings	Moderate: seepage.	Slight	Deep to water	Favorable	Erodes easily	Erodes easily.
La: La Prairie	Moderate: seepage.	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.
Lc: La Prairie	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
Ld: LaDelle	Moderate: seepage.	Severe: hard to pack.	Deep to water	Flooding	Favorable	Favorable.
Le: Lamo	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
Lk: Lamoure	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
Lm:						
Lamoure	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
Rauville	Severe: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Wetness	Wetness.
LnB:						
Lanona	Severe: seepage.	Severe: piping.	Deep to water	Slope, soil blowing.	Soil blowing	Favorable.
Swenoda	Severe: seepage.	Severe: piping.	Slope	Slope, wetness, soil blowing.	Erodes easily, wetness.	Erodes easily.
Lo: Lowe	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action, cutbanks cave.	Wetness, flooding.	Wetness, too sandy.	Wetness.
Lr:						
Lowe	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action, cutbanks cave.	Wetness, flooding.	Wetness, too sandy.	Wetness.
Ludden	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, flooding.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ls: Ludden	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, flooding.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
Lu:						
Ludden, saline	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, excess salt, percs slowly.
Ludden	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, flooding.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
M-W. Miscellaneous water						
MaB, MaC:						
Maddock	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Egeland	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Soil blowing	Droughty.
MeA:						
Maddock	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Embden	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
Mr: Marysland	Severe: seepage.	Severe: seepage, wetness.	Flooding, frost action, cutbanks cave.	Wetness, flooding.	Wetness, too sandy.	Wetness.
Mt:						
McIntosh	Moderate: seepage.	Severe: piping, wetness.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
Badger	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Mu:						
McIntosh	Moderate: seepage.	Severe: piping, wetness.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
Lamoure	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
Mw: Minnewaukan	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, flooding, cutbanks cave.	Ponding, droughty, fast intake.	Ponding, too sandy, soil blowing.	Wetness, droughty.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Mz:						
Moritz	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Wetness	Favorable.
Lamoure	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
Od Oldham	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Og Orthents	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty, rooting depth.
Or Orthents	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Pa Parnell	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
PbB:						
Poinsett	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Buse	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Waubay	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable	Erodes easily	Erodes easily.
PbC:						
Poinsett	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Buse	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Waubay	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
PwA:						
Poinsett	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Waubay	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable	Erodes easily	Erodes easily.
PwB:						
Poinsett	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Waubay	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable	Erodes easily	Erodes easily.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ra: Rauville	Severe: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Wetness	Wetness.
Rp: Rauville	Severe: seepage.	Severe: hard to pack, ponding.	Flooding, frost action, ponding.	Wetness, flooding, ponding.	Wetness, ponding.	Wetness.
RsB, RsC:						
Renshaw	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy	Droughty.
Sioux	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy	Droughty.
Rw: Renwash	Severe: seepage.	Severe: seepage.	Deep to water	Droughty	Too sandy	Droughty.
SbB:						
Singsaas	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Buse	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
ScA:						
Singsaas	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Waubay	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable	Erodes easily	Erodes easily.
ScB:						
Singsaas	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Waubay	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable	Erodes easily	Erodes easily.
ShD, ShE:						
Sioux	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.
Renshaw	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.
So: Southam	Slight	Severe: thin layer, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, excess salt, erodes easily.
Sp: Spottswood	Severe: seepage.	Severe: seepage, wetness.	Flooding, cutbanks cave.	Wetness, flooding.	Wetness, too sandy.	Favorable.
SrA: Strayhoss	Severe: seepage.	Severe: seepage, piping.	Deep to water	Favorable	Erodes easily, too sandy.	Erodes easily.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
SrB: Strayhoss	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope	Erodes easily, too sandy.	Erodes easily.
StB:						
Strayhoss	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope	Erodes easily, too sandy.	Erodes easily.
Maddock	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
SvA: Svea	Moderate: seepage.	Severe: piping.	Deep to water	Wetness	Erodes easily	Erodes easily.
SwA:						
Swenoda	Severe: seepage.	Severe: piping.	Favorable	Wetness, soil blowing.	Erodes easily, wetness.	Erodes easily.
Lanona	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
To: Tonka	Moderate: seepage.	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Tr: Trent	Moderate: seepage.	Moderate: piping.	Deep to water	Wetness	Erodes easily	Erodes easily.
VaA:						
Venagro	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
Svea	Moderate: seepage.	Severe: piping.	Deep to water	Wetness	Erodes easily	Erodes easily.
VaB:						
Venagro	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Favorable	Favorable.
Svea	Moderate: seepage.	Severe: piping.	Deep to water	Wetness	Erodes easily	Erodes easily.
VbA:						
Vienna	Slight	Moderate: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Brookings	Moderate: seepage.	Slight	Deep to water	Favorable	Erodes easily	Erodes easily.
VbB:						
Vienna	Moderate: slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Brookings	Moderate: seepage.	Slight	Deep to water	Favorable	Erodes easily	Erodes easily.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
VnB, VnC:						
Vienna	Moderate: slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Buse	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
W. Water						
Wa:						
Wakonda	Moderate: seepage.	Moderate: piping, wetness.	Frost action	Wetness, excess salt.	Erodes easily, wetness.	Erodes easily.
Chancellor	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Wb Waubay	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable	Erodes easily	Erodes easily.
WeA:						
Wentworth	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Trent	Moderate: seepage.	Moderate: piping.	Deep to water	Wetness	Erodes easily	Erodes easily.
Wo Worthing	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.

Table 16.--Engineering Index Properties

(NP means nonplastic. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Aa--------------- Allivar	0-6	Sandy loam-------	SM, SC, SC-SM	A-2, A-4, A-6	0	95-100	90-100	50-80	20-45	15-30	NP-15
	6-15	Sandy loam, loam, coarse sandy loam.	SM, SC, SC-SM	A-2, A-4, A-6	0	90-100	85-100	50-80	20-45	15-40	NP-15
	15-50	Gravelly coarse sand, sand, gravelly sand.	SP-SM, SM	A-1, A-2, A-3	0	70-100	65-100	10-60	0-15	15-25	NP-5
	50-80	Very gravelly coarse sand, very gravelly sand, extremely gravelly sand.	GM, GP, SM, SP	A-1	0	25-75	20-60	5-30	0-25	10-15	NP-3
Ar--------------- Arlo	0-8	Loam-------------	ML, CL	A-6, A-7	0	100	95-100	85-100	60-85	35-50	10-25
	8-15	Loam, clay loam	CL	A-6, A-7	0	95-100	90-100	70-100	55-85	30-50	10-30
	15-36	Loam, sandy clay loam, clay loam.	ML, CL, SC, SM	A-4, A-6, A-7	0	95-100	90-100	60-95	40-75	30-45	5-20
	36-80	Stratified loamy sand to extremely gravelly sand.	GM, SM, GP-GM, SP-SM	A-2, A-1, A-3	0-5	60-100	40-95	35-65	5-35	15-35	NP-10
AvB-------------- Arvilla	0-8	Sandy loam-------	SM, SC, SC-SM	A-2, A-4, A-6	0	95-100	90-100	50-80	20-45	15-30	NP-15
	8-19	Sandy loam, loam, coarse sandy loam.	SM, SC, SC-SM	A-2, A-4, A-6	0	90-100	85-100	50-80	20-45	15-40	NP-15
	19-60	Gravelly coarse sand, coarse sand, very gravelly coarse sand.	SP-SM, GM, SP, GP-GM	A-1, A-2, A-3	0	35-100	25-100	10-60	0-15	0-25	NP
Ba--------------- Badger	0-17	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-50	10-25
	17-42	Silty clay, clay, silty clay loam.	CH, ML, CL, MH	A-7	0	100	100	90-100	75-95	45-65	15-35
	42-60	Silty clay loam, silt loam, silty clay.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
BbA, BbB--------- Barnes	0-7	Clay loam--------	CL, CL-ML	A-6, A-4	0-5	90-100	85-100	85-100	70-80	30-45	15-25
	7-18	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-45	10-25
	18-42	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-45	10-25
	42-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-45	10-25
BcB:											
Barnes----------	0-7	Loam-------------	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	80-100	60-80	25-35	10-20
	7-18	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-45	10-25
	18-42	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-45	10-25
	42-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-45	10-25
Buse------------	0-7	Loam-------------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-32	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	32-80	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
BeA, BeB---------Brandt	0-9	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	11-25
	9-35	Silty clay loam, silt loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-100	35-50	8-23
	35-48	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	85-100	60-100	30-40	5-15
	48-60	Stratified sand to very gravelly sand.	SM, GM, GM-GC, GP-GM	A-1, A-2	0-5	50-80	30-70	20-50	5-35	15-25	NP-5
Bf---------------Brookings	0-9	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	9-24	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	24-30	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	15-25
	30-80	Loam, clay loam	CL	A-6, A-7	0	100	95-100	85-100	70-85	35-50	15-25
BgC, BgD:											
Buse------------	0-7	Loam-------------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-32	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	32-80	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Barnes----------	0-7	Loam-------------	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	80-100	60-80	25-35	10-20
	7-18	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-45	10-25
	18-42	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-45	10-25
	42-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-45	10-25
BhC, BhE:											
Buse------------	0-7	Loam-------------	ML, CL	A-4, A-6	0-70	90-100	85-95	70-90	55-80	30-40	5-15
	7-32	Loam, clay loam, very stony loam.	CL	A-4, A-6	0-30	90-100	85-95	70-90	60-80	25-40	8-15
	32-80	Loam, clay loam, very stony loam.	CL	A-4, A-6	0-30	90-100	85-95	70-90	60-80	25-40	8-15
Barnes----------	0-7	Loam-------------	CL	A-6	3-25	90-100	85-100	80-100	60-75	25-40	10-20
	7-18	Loam, clay loam, stony loam.	CL, CL-ML	A-4, A-6	0-20	90-100	85-100	75-95	60-80	25-40	5-20
	18-60	Loam, clay loam, stony loam.	CL, CL-ML	A-4, A-6	0-15	90-100	85-100	75-95	60-80	25-40	5-20
BkE:											
Buse------------	0-7	Loam-------------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-32	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	32-80	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Lamoure---------	0-28	Silty clay loam	CL, CH, MH, ML	A-7	0	100	100	95-100	85-100	40-70	15-35
	28-57	Silty clay loam, silt loam.	CL, CH, MH, ML	A-7	0	100	100	90-100	60-100	40-70	15-35
	57-60	Stratified sandy loam to silty clay loam.	CL, ML, SC, SM	A-1, A-6, A-7	0	95-100	95-100	70-95	35-90	30-70	10-35

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
BoE:											
Buse------------	0-7	Loam------------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-32	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	32-80	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Langhei---------	0-3	Clay loam--------	CL, ML	A-7, A-6	0	95-100	90-100	75-95	70-80	35-45	10-20
	3-14	Clay loam, silty clay loam.	CL, ML	A-7, A-6	0	95-100	90-100	75-95	70-80	35-45	10-20
	14-80	Clay loam, silty clay loam.	CL, ML	A-7, A-6	0	95-100	90-100	75-95	70-80	35-45	10-20
BpD:											
Buse------------	0-7	Loam------------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-32	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	32-80	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Poinsett--------	0-8	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	8-23	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	23-62	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	62-80	Clay loam--------	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
BrD:											
Buse------------	0-7	Very stony loam	ML, CL	A-4, A-6	0-70	90-100	85-95	70-90	55-80	30-40	5-15
	7-32	Loam, clay loam, very stony loam.	CL	A-4, A-6	0-30	90-100	85-95	70-90	60-80	25-40	8-15
	32-80	Loam, clay loam, very stony loam.	CL	A-4, A-6	0-30	90-100	85-95	70-90	60-80	25-40	8-15
Poinsett--------	0-8	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	8-23	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	23-62	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	62-80	Clay loam--------	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
BsC:											
Buse------------	0-7	Loam------------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-32	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	32-80	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Singsaas--------	0-13	Silty clay loam	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	80-100	35-55	10-30
	13-19	Silty clay loam, loam, clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	70-100	35-55	10-30
	19-41	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	60-85	35-50	11-25
	41-80	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	35-50	11-25

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
BxE:											
Buse	0-7	Loam	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-32	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	32-80	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Sioux	0-7	Gravelly loam	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	7-10	Gravelly loam, gravelly sandy loam, gravelly loamy sand.	SM, GM	A-4, A-2, A-1	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	10-60	Extremely gravelly sand, very gravelly loamy sand, very gravelly sand.	GM, GP, SM, SP	A-1	0-5	25-75	20-60	5-35	0-25	0-25	NP-5
Ca Castlewood	0-12	Silty clay	CH, MH	A-7	0	100	100	100	90-100	50-75	25-40
	12-46	Clay loam, silty clay, clay.	CL, CH, MH, ML	A-7	0	100	100	90-100	90-100	45-75	20-40
	46-80	Silty clay loam, clay loam, silty clay.	CL, CH, MH, ML	A-7	0	100	95-100	85-100	75-100	45-75	20-40
Ch Chaska	0-7	Loam	CL, CL-ML	A-4, A-6	0	100	100	85-95	60-75	30-36	11-15
	7-60	Stratified silt loam to loamy fine sand.	CL, CL-ML	A-4, A-6	0	100	100	85-95	60-75	20-40	5-15
Cm Clamo	0-9	Silty clay	CH, MH	A-7	0	100	95-100	95-100	85-100	50-75	25-40
	9-27	Silty clay loam, silty clay, clay.	CL, CH, MH, ML	A-7	0	100	95-100	90-100	85-100	45-75	20-40
	27-60	Silty clay loam, silty clay.	CL, CH, MH, ML	A-7	0	100	95-100	90-100	85-100	45-75	20-40
Co:											
Cubden	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	80-100	35-50	10-25
	10-33	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	25-55	10-30
	33-48	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	20-55	10-30
	48-60	Clay loam, loam	CL	A-6, A-7	0	100	95-100	85-100	70-85	35-50	15-30
Badger	0-17	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-50	10-25
	17-42	Silty clay, clay, silty clay loam.	CH, ML, CL, MH	A-7	0	100	100	90-100	75-95	45-65	15-35
	42-60	Silty clay loam, silt loam, silty clay.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
Ct:											
Cubden	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	80-100	35-50	10-25
	10-33	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	25-55	10-30
	33-48	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	20-55	10-30
	48-60	Clay loam, loam	CL	A-6, A-7	0	100	95-100	85-100	70-85	35-50	15-30

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Ct:											
Tonka-----------	0-24	Silty clay loam	CL	A-6, A-7	0-2	100	95-100	90-100	70-90	45-55	20-30
	24-49	Silty clay loam, clay loam, silty clay.	CH, CL	A-6, A-7	0-2	100	95-100	90-100	75-95	50-60	30-40
	49-60	Silty clay loam, clay loam, loam.	CL, CL-ML	A-6, A-7, A-4	0-3	90-100	85-100	60-100	50-90	35-55	15-30
DaB-------------- Darnen	0-13	Loam------------	ML, CL, CL-ML	A-4	0	100	100	85-100	60-90	20-35	2-10
	13-46	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0	100	100	85-100	60-90	20-45	5-25
	46-80	Loam, clay loam, silt loam.	CL, CL-ML	A-4, A-6, A-7	0	90-100	90-100	80-95	60-90	20-45	5-25
DcA-------------- Davis	0-12	Loam------------	CL, ML	A-4, A-6, A-7	0	100	90-100	80-100	60-85	30-45	5-20
	12-48	Loam, sandy loam, fine sandy loam.	CL, ML, SM, CL-ML	A-4, A-6, A-7	0	100	90-100	60-95	30-75	30-45	5-20
	48-60	Loam, clay loam, silt loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	85-100	55-90	30-45	5-20
DcB-------------- Davis	0-12	Loam------------	CL, ML	A-6, A-7, A-4	0	100	90-100	80-100	60-85	30-45	5-20
	12-48	Loam, sandy loam, fine sandy loam.	CL, ML, SM, CL-ML	A-6, A-7, A-4	0	100	90-100	60-95	30-75	35-45	10-20
	48-60	Loam, clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	85-100	55-90	30-45	10-20
Dm--------------- Dimo	0-8	Clay loam--------	CL	A-6, A-7	0	100	100	85-95	70-85	35-45	12-20
	8-31	Clay loam, loam, sandy clay loam.	CL	A-6, A-7	0	90-100	85-100	85-95	50-80	35-45	12-20
	31-60	Gravelly sand, gravelly loamy sandy, very gravelly sand.	SM, SP-SM, SW-SM, SC-SM	A-1, A-2, A-3	0-5	60-90	40-70	20-60	5-30	15-25	NP-5
Dn--------------- Divide	0-7	Loam------------	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-95	60-85	25-40	5-20
	7-26	Loam, clay loam, gravelly loam.	CL, CL-ML, SC-SM, SC	A-4, A-6, A-7	0-3	95-100	75-100	55-90	35-80	20-45	5-20
	26-60	Stratified sand to gravelly sand.	GM, SM, GP-GM, SP-SM	A-1, A-3, A-2-4	0-5	25-100	15-100	10-70	5-25	0-30	NP-5
DoB-------------- Doland	0-8	Loam------------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-95	60-75	28-35	9-15
	8-21	Silt loam, loam	ML, CL	A-4, A-6	0	100	100	85-100	60-90	25-40	7-15
	21-60	Loam, clay loam	CL	A-6, A-7	0	90-100	85-95	80-90	55-80	30-45	10-20
DsA:											
Doland----------	0-8	Loam------------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-95	60-75	28-35	9-15
	8-21	Silt loam, loam	ML, CL	A-4, A-6	0	100	100	85-100	60-90	25-40	7-15
	21-60	Loam, clay loam	CL	A-6, A-7	0	90-100	85-95	80-90	55-80	30-45	10-20
Svea-----------	0-18	Loam------------	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	80-95	60-80	20-38	5-15
	18-28	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6,	0-5	95-100	85-100	80-95	60-90	20-45	5-25
	28-80	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6,	0-5	95-100	85-100	80-95	60-90	20-50	5-30

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
EaB:											
Egan------------	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	10-24	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	10-30
	24-57	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
	57-80	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
Ethan-----------	0-8	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	55-85	25-40	5-20
	8-40	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	40-80	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
EeB:											
Egan------------	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	10-24	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	10-30
	24-57	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
	57-80	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
Wentworth-------	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	11-25
	8-27	Silty clay loam, silt loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	80-100	35-55	10-30
	27-60	Silty clay loam, silt loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	85-100	60-100	30-50	5-25
Trent-----------	0-13	Silty clay loam	CL, CH, ML, MH	A-6, A-7	0	100	100	95-100	90-100	35-55	10-30
	13-35	Silty clay loam	CL, CH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	15-30
	35-60	Silt loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	70-100	30-50	8-20
EgA, EgB:											
Egeland---------	0-8	Sandy loam-------	SM, SC-SM	A-2, A-4	0	100	95-100	75-100	30-50	15-25	NP-7
	8-30	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	15-50	15-25	NP-7
	30-80	Loamy sand, loamy fine sand, loamy very fine sand.	SM, SP-SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	10-45	15-25	NP-5
Embden----------	0-16	Fine sandy loam	SM, ML	A-2, A-4	0	100	100	60-95	30-65	15-35	NP-10
	16-29	Fine sandy loam, sandy loam.	SM	A-2, A-4	0	100	100	60-85	30-50	15-25	NP
	29-80	Fine sandy loam, loamy sand, loamy fine sand.	SM	A-2, A-4	0	100	100	50-80	15-50	15-25	NP
EnA-------------- Enet	0-8	Loam-------------	ML, CL	A-4, A-6	0	100	100	85-95	55-80	30-40	5-15
	8-22	Loam, clay loam, sandy clay loam.	CL, ML, SC, SM	A-4, A-6	0	90-100	85-100	70-95	45-75	30-40	5-15
	22-26	Loam, fine sandy loam, sandy loam.	ML, CL, SM, SC	A-4, A-6	0	90-100	85-95	60-95	40-75	20-40	3-15
	26-60	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM, SC-SM	A-1, A-2, A-3	0	60-95	45-90	10-60	0-15	15-25	NP-5

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
EsA, EsB--------- Estelline	0-9	Silt loam--------	CL, ML	A-4, A-6, A-7	0	100	100	95-100	80-100	30-45	5-20
	9-34	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	11-25
	34-37	Silt loam, loam, silty clay loam.	CL, ML	A-4, A-6	0	100	100	80-100	70-100	30-40	5-15
	37-60	Sand and gravel, loamy sand, sand.	SM, SW-SM, SP-SM	A-1	0-5	70-100	50-85	10-50	5-25	15-25	NP-5
EtB:											
Estelline-------	0-9	Silt loam--------	CL, ML	A-4, A-6, A-7	0	100	100	95-100	80-100	30-45	5-20
	9-34	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	11-25
	34-37	Silt loam, loam, silty clay loam.	CL, ML	A-4, A-6	0	100	100	80-100	70-100	30-40	5-15
	37-60	Sand and gravel, loamy sand, sand.	SM, SW-SM, SP-SM	A-1	0-5	70-100	50-85	10-50	5-25	15-25	NP-5
Sioux-----------	0-7	Gravelly loam----	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	7-10	Gravelly loam, gravelly sandy loam, gravelly loamy sand.	SM, GM	A-4, A-2, A-1	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	10-60	Extremely gravelly sand, very gravelly loamy sand, very gravelly sand.	GM, GP, SM, SP	A-1	0-5	25-75	20-60	5-35	0-25	0-25	NP-5
EvD:											
Ethan-----------	0-8	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	55-85	25-40	5-20
	8-40	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	40-80	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
Clarno----------	0-8	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	95-100	85-100	55-85	25-40	5-20
	8-15	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	15-47	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	47-60	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
EwC:											
Ethan-----------	0-8	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	55-85	25-40	5-20
	8-40	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	40-80	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
Egan------------	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	10-24	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	10-30
	24-57	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
	57-80	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
Fa--------------- Fairdale	0-6	Loam-------------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	60-90	20-40	3-15
	6-60	Stratified fine sand to silty clay loam.	ML, CL, CL-ML, SC	A-4, A-6	0	100	100	50-100	15-90	20-40	NP-20

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
Fb-------------- Fordtown	0-13	Loam-------------	ML, CL	A-4, A-6, A-7	0	95-100	90-100	70-85	55-75	30-45	5-20
	13-29	Loam, silt loam	CL, ML	A-4, A-6	0	95-100	90-100	70-95	55-80	30-45	5-20
	29-80	Sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM	A-1, A-3, A-2-4	0	65-85	35-80	0-80	0-35	15-21	NP-4
Fc:											
Fordtown--------	0-13	Loam-------------	ML, CL, SM, SC	A-4, A-6, A-7	0	95-100	90-100	45-100	45-90	30-45	5-20
	13-29	Loam, silt loam	CL, SC	A-4, A-6	0	95-100	90-100	45-100	45-100	28-34	9-14
	29-80	Sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM	A-1, A-3, A-2-4	0	65-85	35-80	0-80	0-35	15-21	NP-4
Spottswood------	0-10	Loam-------------	CL, CL-ML	A-6, A-4	0	95-100	95-100	75-100	50-90	25-40	5-15
	10-17	Clay loam, loam	CL	A-6, A-7	0	95-100	95-100	75-100	50-80	30-45	10-20
	17-26	Sandy loam, loam	SC, SC-SM	A-4, A-2-4	0	95-100	90-100	45-70	15-40	20-30	5-10
	26-80	Gravelly sand, gravelly loamy sand.	SM, GM, SP-SM, GP-GM	A-1, A-2	0-5	40-85	35-80	15-70	5-30	15-20	NP-4
FdA------------- Fordville	0-7	Loam-------------	ML, CL	A-4, A-6, A-7	0	100	100	70-85	55-75	30-45	5-20
	7-17	Loam, silt loam, clay loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	70-95	55-80	30-45	5-20
	17-27	Loam, clay loam, fine sandy loam.	CL, ML, SM, SC	A-4, A-6	0	95-100	90-100	65-90	40-55	25-40	3-15
	27-60	Gravelly loamy sand, gravelly sand, sand.	SW, SW-SM, SM	A-1	0	65-85	45-70	15-45	0-15	15-25	NP-5
FrB:											
Fordville-------	0-7	Loam-------------	ML, CL	A-4, A-6, A-7	0	100	100	70-85	55-75	30-45	5-20
	7-17	Loam, silt loam, clay loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	70-95	55-80	30-45	5-20
	17-27	Loam, clay loam, fine sandy loam.	CL, ML, SM, SC	A-4, A-6	0	95-100	90-100	65-90	40-55	25-40	3-15
	27-60	Gravelly loamy sand, gravelly sand, sand.	SW, SW-SM, SM	A-1	0	65-85	45-70	15-45	0-15	15-25	NP-5
Renshaw---------	0-7	Loam-------------	ML, CL	A-4, A-6	0-5	95-100	90-100	70-100	50-75	30-40	5-15
	7-18	Loam, sandy clay loam, gravelly loam.	SC-SM, SC, ML, CL	A-4, A-6	0-5	95-100	55-100	45-90	35-70	20-40	3-15
	18-60	Gravelly loamy sand, very gravelly loamy sand, gravelly sand.	SW, SM, SW-SM, GW-GM	A-1, A-2	0-5	45-95	30-80	10-60	0-15	0-25	NP-5

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Gs---------------- Goldsmith	0-8	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	8-33	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	75-100	30-45	5-20
	33-48	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	85-100	70-100	30-45	5-20
	48-59	Gravelly loam, loam.	CL, SC	A-4, A-6	0-5	90-100	65-95	35-90	25-80	28-34	9-14
	59-80	Sand, very gravelly sand, gravelly loamy sand.	SM, GM, GP-GM	A-1, A-2, A-3	0-5	50-100	30-95	20-60	5-35	15-25	NP-5
Hb:											
Hamerly---------	0-13	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	80-95	60-90	20-40	5-20
	13-31	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-75	20-45	5-25
	31-80	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	75-95	55-75	20-45	5-25
Badger----------	0-17	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-50	10-25
	17-42	Silty clay, clay, silty clay loam.	CH, ML, CL, MH	A-7	0	100	100	90-100	75-95	45-65	15-35
	42-60	Silty clay loam, silt loam, silty clay.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
Hc:											
Hamerly---------	0-13	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	80-95	60-90	20-40	5-20
	13-31	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	80-95	60-75	20-45	5-25
	31-80	Loam, clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	75-95	55-75	20-45	5-25
Cavour----------	0-7	Clay loam--------	CL, CH, MH, ML	A-7, A-6	0	100	90-100	85-100	70-85	30-55	10-25
	7-22	Clay, clay loam, silty clay.	CL, CH	A-7, A-6	0	100	90-100	85-100	60-85	30-55	10-35
	22-30	Clay loam, clay, loam.	CL, CH	A-7, A-6	0	95-100	90-100	75-100	50-85	35-65	12-35
	30-80	Clay loam, loam	CL, CH	A-7, A-6	0-5	95-100	90-100	75-100	50-85	35-65	12-35
Badger----------	0-17	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-50	10-25
	17-42	Silty clay, clay, silty clay loam.	CH, ML, CL, MH	A-7	0	100	100	90-100	75-95	45-65	15-35
	42-60	Silty clay loam, silt loam, silty clay.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
HeA, HeB--------- Hetland	0-8	Silty clay loam	CL, CH	A-7	0	100	100	95-100	90-100	45-60	20-35
	8-24	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	90-100	40-60	20-35
	24-42	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	90-100	40-60	15-30
	42-60	Stratified very fine sandy loam to silty clay loam.	CL, CH	A-6, A-7	0	100	95-100	95-100	85-100	35-55	11-30

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
KrA, KrB:											
Kranzburg-------	0-9	Silty clay loam	CL, CH	A-7	0	100	100	95-100	90-100	40-55	15-30
	9-18	Silty clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	15-30
	18-25	Silty clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	15-30
	25-51	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
	51-80	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
Brookings-------	0-9	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	9-24	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	24-30	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	15-25
	30-80	Loam, clay loam	CL	A-6, A-7	0	100	95-100	85-100	70-85	35-50	15-25
La--------------- La Prairie	0-14	Loam-------------	CL-ML, CL	A-4, A-6	0	100	100	85-95	70-80	25-40	5-15
	14-39	Silt loam, loam, silty clay loam.	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	50-90	25-50	5-25
	39-80	Silt loam, loam, silty clay loam.	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	70-90	25-50	5-25
Lc--------------- La Prairie	0-14	Loam-------------	CL-ML, CL	A-4, A-6	0	100	100	85-95	70-80	25-40	5-15
	14-39	Silt loam, loam, silty clay loam.	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	50-90	25-50	5-25
	39-80	Silt loam, loam, silty clay loam.	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	70-95	25-50	5-25
Ld--------------- LaDelle	0-20	Silt loam--------	ML, CL	A-4, A-6, A-7	0	100	100	90-100	80-100	30-45	7-20
	20-44	Silt loam, silty clay loam, loam.	CL, ML, MH, CH	A-6, A-7	0	100	100	90-100	75-100	30-55	10-25
	44-80	Stratified silt loam to clay loam.	CL, CL-ML, CH	A-4, A-6, A-7	0	100	100	90-100	75-100	25-60	5-30
Le--------------- Lamo	0-16	Silty clay loam	CL, CH	A-7, A-6, A-4	0	100	100	95-100	80-95	25-55	8-25
	16-60	Silty clay loam, silt loam.	CL, CH	A-7, A-6	0	100	100	95-100	85-95	30-55	11-25
Lk--------------- Lamoure	0-28	Silty clay loam	CL, CH, MH, ML	A-7	0	100	100	95-100	85-100	45-70	20-35
	28-57	Silty clay loam, silt loam.	CL, CH, MH, ML	A-7	0	100	100	90-100	85-100	40-70	15-35
	57-60	Stratified gravelly loam to silty clay loam.	CL, SC	A-6, A-7	0	95-100	95-100	70-95	85-90	30-70	10-35
Lm:											
Lamoure---------	0-28	Silty clay loam	CL, CH, MH, ML	A-7	0	100	100	95-100	85-100	40-70	15-35
	28-57	Silty clay loam, silt loam.	CL, CH, MH, ML	A-7	0	100	100	90-100	60-100	40-70	15-35
	57-60	Stratified gravelly loam to silty clay loam.	CL, SC	A-6, A-7	0	90-100	90-100	70-95	35-90	30-70	10-35

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Lm:											
Rauville	0-24	Silty clay loam	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	85-100	35-60	15-28
	24-48	Silty clay loam, silt loam, silty clay.	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	85-100	35-60	15-28
	48-60	Stratified gravelly sand to clay loam.	SM, SC, CL, ML	A-2, A-4	0	80-100	65-95	50-85	15-70	15-30	NP-10
LnB:											
Lanona	0-8	Sandy loam	SM, SC, SC-SM	A-2, A-4	0	100	95-100	70-100	30-50	20-30	NP-10
	8-34	Fine sandy loam, sandy loam.	SM, SC-SM, SC	A-2, A-4	0	100	95-100	60-100	30-50	20-30	NP-10
	34-80	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	75-100	50-95	25-45	5-20
Swenoda	0-8	Sandy loam	SM	A-2, A-4	0	100	95-100	70-100	30-50	20-30	NP-7
	8-34	Fine sandy loam, sandy loam, loam.	SC-SM, SM, ML, CL-ML	A-2, A-4	0	100	95-100	60-100	30-55	15-30	NP-10
	34-60	Silt loam, silty clay loam, loam.	CL, CL-ML	A-4, A-6, A-7	0-5	90-100	90-100	75-100	50-95	25-50	5-30
Lo Lowe	0-10	Loam	ML, CL	A-4, A-6, A-7	0	100	100	90-100	60-75	30-45	5-20
	10-36	Clay loam, loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	50-85	35-50	11-25
	36-80	Stratified silty clay loam to loamy sand.	ML, CL, SM, SC	A-4, A-6, A-7	0	100	100	85-100	45-75	30-45	5-20
Lr:											
Lowe	0-10	Loam	ML, CL	A-4, A-6, A-7	0	100	100	90-100	60-75	30-45	5-20
	10-36	Clay loam, loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	60-85	35-50	11-25
	36-80	Stratified silty clay loam to loamy sand.	ML, CL, SM, SC	A-4, A-6, A-7	0	100	100	85-100	45-75	30-45	5-20
Ludden	0-22	Silty clay	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
	22-40	Silty clay, clay	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
	40-60	Silty clay, clay, clay loam.	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
Ls Ludden	0-22	Silty clay	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
	22-40	Silty clay, clay	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
	40-60	Silty clay, clay, clay loam.	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
Lu:											
Ludden, saline	0-22	Silty clay	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
	22-40	Silty clay, clay	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
	40-60	Silty clay, clay, clay loam.	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
Ludden	0-22	Silty clay	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
	22-40	Silty clay, clay	CH	A-7	0	100	100	95-100	75-95	50-75	25-50
	40-60	Silty clay, clay, clay loam.	CH	A-7	0	100	100	95-100	75-95	50-75	25-50

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
M-W. Miscellaneous water											
MaB:											
Maddock	0-7	Sandy loam	SM	A-2, A-4	0	100	100	60-85	30-50	15-25	NP
	7-80	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM	A-2, A-3	0	95-100	95-100	60-100	5-35	0-25	NP
Egeland	0-8	Sandy loam	SM, SC-SM	A-2, A-4	0	100	95-100	75-100	30-50	15-25	NP-7
	8-21	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	15-50	15-25	NP-7
	21-80	Loamy sand, loamy fine sand, loamy very fine sand.	SM, SP-SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	10-45	15-25	NP-5
MaC:											
Maddock	0-7	Sandy loam	SM	A-2, A-4	0	100	100	60-85	30-50	15-25	NP
	7-80	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM	A-2, A-3	0	95-100	95-100	60-100	5-35	0-25	NP
Egeland	0-8	Sandy loam	SM, SC-SM	A-2, A-4	0	100	95-100	75-100	30-50	15-25	NP-7
	8-30	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	15-50	15-25	NP-7
	30-80	Loamy sand, loamy fine sand, loamy very fine sand.	SM, SP-SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	10-45	15-25	NP-5
MeA:											
Maddock	0-7	Sandy loam	SM	A-2, A-4	0	100	100	60-85	30-50	15-25	NP
	7-80	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM	A-2, A-3	0	95-100	95-100	60-100	5-35	0-25	NP
Embden	0-16	Fine sandy loam	SM, ML	A-2, A-4	0	100	100	60-95	30-65	15-35	NP-10
	16-29	Fine sandy loam, sandy loam.	SM	A-2, A-4	0	100	100	60-85	30-50	15-25	NP
	29-80	Fine sandy loam, loamy sand, loamy fine sand.	SM	A-2, A-4	0	100	100	50-80	15-50	15-25	NP
Mr Marysland	0-9	Loam	CL	A-6, A-7	0	95-100	95-100	85-95	50-80	30-50	10-25
	9-38	Loam, clay loam, sandy clay loam.	CL, SC	A-6	0	90-100	85-100	80-95	45-80	20-40	10-20
	38-80	Stratified fine sand to very gravelly coarse sand.	SP-SM, SM, GP, GM	A-1, A-2, A-3	0	70-95	50-90	35-70	5-20	0-30	NP
Mt:											
McIntosh	0-8	Silty clay loam	CL, ML	A-4, A-6	0	100	100	85-95	60-80	20-40	3-25
	8-31	Silt loam, silty clay loam, loam.	ML, CL	A-4, A-6	0	100	100	90-100	70-90	28-43	9-21
	31-80	Loam, clay loam	CL, ML	A-6, A-4	0-5	95-100	90-100	80-95	60-80	28-43	9-21
Badger	0-17	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-50	10-25
	17-42	Silty clay, clay, silty clay loam.	CH, ML, CL, MH	A-7	0	100	100	90-100	75-95	45-65	15-35
	42-60	Silty clay loam, silt loam, silty clay.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Mu:											
McIntosh--------	0-8	Silty clay loam	CL, ML	A-4, A-6	0	100	100	85-95	60-80	20-40	3-25
	8-31	Silt loam, silty clay loam, loam.	ML, CL	A-4, A-6	0	100	100	90-100	70-90	28-43	9-21
	31-80	Loam, clay loam	CL, ML	A-6, A-4	0-5	95-100	90-100	80-95	60-80	28-43	9-21
Lamoure---------	0-28	Silty clay loam	CL, CH, MH, ML	A-7	0	100	100	95-100	85-100	40-70	15-35
	28-57	Silty clay loam, silt loam.	CL, CH, MH, ML	A-7	0	100	100	90-100	60-100	40-70	15-35
	57-60	Stratified gravelly loam to silty clay loam.	CL, SC	A-6, A-7	0	90-100	90-100	70-95	35-90	30-70	10-35
Mw--------------- Minnewaukan	0-5	Loamy sand-------	SM	A-2	0	90-100	70-100	50-85	15-30	0-20	NP-10
	5-60	Sand, loamy sand, fine sand.	SM, SP-SM	A-2, A-3	0	90-100	70-100	60-100	5-35	0-20	NP-10
Mz:											
Moritz----------	0-15	Loam-------------	CL	A-6	0	100	100	85-100	60-75	30-40	10-20
	15-80	Loam, clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	60-80	35-50	11-25
Lamoure---------	0-28	Silty clay loam	CL, CH, MH, ML	A-7	0	100	100	95-100	85-100	40-70	15-35
	28-57	Silty clay loam, silt loam.	CL, CH, MH, ML	A-7	0	100	100	90-100	60-100	40-70	15-35
	57-60	Stratified gravelly loam to silty clay loam.	CL, SC	A-6, A-7	0	90-100	90-100	70-95	35-90	30-70	10-35
Od--------------- Oldham	0-9	Silty clay loam	CL, CH, MH, ML	A-7	0	100	95-100	90-100	85-100	40-60	15-25
	9-40	Silty clay loam, clay loam, silty clay.	CL, CH, MH, ML	A-7	0	100	95-100	85-100	85-100	40-60	15-25
	40-80	Silty clay loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	95-100	85-100	70-100	25-45	5-20
Og--------------- Orthents	0-3	Gravelly loam----	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	3-80	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM	A-1	0-10	60-85	45-70	15-45	0-15	15-25	NP-5
Or--------------- Orthents	0-80	Clay loam--------	CL	A-6, A-7	0-5	95-100	90-100	80-95	75-95	30-45	10-25
Pa--------------- Parnell	0-17	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	17-45	Clay loam, silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	90-100	70-100	40-80	20-50
	45-60	Clay loam, silty clay loam, silty clay.	CL, CH	A-6, A-7	0	95-100	90-100	80-95	70-95	30-80	15-50

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
PbB, PbC:											
Poinsett--------	0-8	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	8-23	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	23-62	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	62-80	Clay loam--------	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
Buse------------	0-7	Loam-------------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-32	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	32-80	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Waubay----------	0-12	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	12-25	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	25-41	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	41-60	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-95	30-45	5-20
PwA, PwB:											
Poinsett--------	0-8	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	8-23	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	23-62	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	62-80	Clay loam--------	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
Waubay----------	0-12	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	12-25	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	25-41	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	41-60	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-95	30-45	5-20
Ra, Rp----------- Rauville	0-24	Silty clay loam	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	85-100	35-60	15-28
	24-48	Silty clay loam, silt loam, silty clay.	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	85-100	35-60	15-28
	48-60	Stratified gravelly sand to clay loam.	SM, SC, CL, ML	A-2, A-4	0	80-100	65-95	50-85	15-70	15-30	NP-10
RsB, RsC:											
Renshaw---------	0-7	Loam-------------	ML, CL	A-4, A-6	0-5	95-100	90-100	70-100	50-75	30-40	5-15
	7-18	Loam, sandy clay loam, gravelly loam.	SC-SM, SC, ML, CL	A-4, A-6	0-5	95-100	55-100	45-90	35-70	20-40	3-15
	18-60	Gravelly loamy sand, very gravelly loamy sand, gravelly sand.	SW, SM, SW-SM, GW-GM	A-1, A-2	0-5	45-95	30-80	10-60	0-15	0-25	NP-5

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
RsB, RsC:											
Sioux-----------	0-7	Gravelly loam----	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	7-10	Gravelly loam, gravelly sandy loam, gravelly loamy sand.	SM, GM	A-4, A-2, A-1	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	10-60	Extremely gravelly sand, very gravelly loamy sand, very gravelly sand.	GM, GP, SM, SP	A-1	0-5	25-75	20-60	5-35	0-25	0-25	NP-5
Rw--------------- Renwash	0-7	Loam-------------	ML, CL, SM, SC	A-4, A-6	0	95-100	90-100	70-100	50-75	30-40	7-15
	7-17	Loam, sandy loam	ML, CL, SM, SC	A-2, A-4, A-6, A-1-b	0	95-100	85-100	45-100	10-90	25-40	3-15
	17-80	Gravelly loamy sand, very gravelly sand, gravelly sand.	SW, SM, SW-SM, GP	A-1, A-2, A-3	0	45-95	30-75	5-70	0-30	15-20	NP-4
SbB:											
Singsaas--------	0-13	Silty clay loam	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	80-100	35-55	10-30
	13-19	Silty clay loam, loam, clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	70-100	35-55	10-30
	19-41	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	60-85	35-50	11-25
	41-80	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	35-50	11-25
Buse------------	0-7	Loam-------------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-32	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	32-80	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
ScA, ScB:											
Singsaas--------	0-13	Silty clay loam	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	80-100	35-55	10-30
	13-19	Silty clay loam, loam, clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	70-100	35-55	10-30
	19-41	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	60-85	35-50	11-25
	41-80	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	35-50	11-25
Waubay----------	0-12	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	12-25	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	25-41	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	41-60	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-95	30-45	5-20

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
ShD, ShE:											
Sioux	0-7	Gravelly loam	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	7-10	Gravelly loam, gravelly sandy loam, gravelly loamy sand.	SM, GM	A-4, A-2, A-1	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	10-60	Extremely gravelly sand, very gravelly loamy sand, very gravelly sand.	GM, GP, SM, SP	A-1	0-5	25-75	20-60	5-35	0-25	0-25	NP-5
Renshaw	0-7	Loam	ML, CL	A-4, A-6	0-5	95-100	90-100	70-100	50-75	30-40	5-15
	7-18	Loam, sandy clay loam, gravelly loam.	SC-SM, SC, ML, CL	A-4, A-6	0-5	95-100	55-100	45-90	35-70	20-40	3-15
	18-60	Gravelly loamy sand, very gravelly loamy sand, gravelly sand.	SW, SM, SW-SM, GW-GM	A-1, A-2	0-5	45-95	30-80	10-60	0-15	0-25	NP-5
So Southam	0-12	Silty clay loam	CL, OL, CH	A-7	0	100	95-100	90-100	80-100	40-55	20-35
	12-80	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	95-100	90-100	85-100	50-65	30-40
Sp Spottswood	0-10	Loam	CL, CL-ML	A-6, A-4	0	95-100	95-100	75-100	50-90	25-40	5-15
	10-17	Clay loam, loam	CL	A-6, A-7	0	95-100	95-100	75-100	50-80	30-45	10-20
	17-26	Sandy loam, loam	SC, SC-SM	A-4, A-2-4	0	95-100	90-100	45-70	15-40	20-30	5-10
	26-80	Gravelly sand, gravelly loamy sand.	SM, GM, SP-SM, GP-GM	A-1, A-2	0-5	40-85	35-80	15-70	5-30	15-20	NP-4
SrA, SrB Strayhoss	0-8	Loam	ML, CL	A-4, A-6	0	100	100	90-100	80-100	30-45	5-20
	8-24	Silty clay loam, silt loam, loam.	CL, ML	A-6, A-7, A-4	0	100	100	90-100	80-100	30-50	5-25
	24-30	Silty clay loam, silt loam, loam.	CL, ML	A-7, A-6, A-4	0	100	100	90-100	85-100	30-50	5-25
	30-80	Stratified loamy sand to silt loam.	SP-SM, SM, SC-SM, ML, CL	A-2, A-3, A-4, A-6	0	100	100	50-90	5-60	15-50	NP-20
StB:											
Strayhoss	0-8	Loam	ML, CL	A-4, A-6	0	100	100	90-100	80-100	30-45	5-20
	8-24	Silty clay loam, silt loam, loam.	CL, ML	A-6, A-7, A-4	0	100	100	90-100	80-100	30-50	5-25
	24-30	Silty clay loam, silt loam, loam.	CL, ML	A-7, A-6, A-4	0	100	100	90-100	85-100	30-50	5-25
	30-80	Stratified loamy sand to silt loam.	SP-SM, SM, SC-SM, ML, CL	A-2, A-3, A-4, A-6	0	100	100	50-90	5-60	15-50	NP-20
Maddock	0-7	Sandy loam	SM	A-2, A-4	0	100	100	60-85	30-50	15-25	NP
	7-80	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM	A-2, A-3	0	95-100	95-100	60-100	5-35	0-25	NP
SvA Svea	0-18	Loam	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	80-95	60-80	20-38	5-15
	18-28	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	85-100	80-95	60-90	20-45	5-25
	28-80	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	85-100	80-95	60-90	20-50	5-30

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
SwA:											
Swenoda---------	0-8	Sandy loam-------	SM	A-2, A-4	0	100	95-100	70-100	30-50	20-30	NP-7
	8-34	Fine sandy loam, sandy loam, loam.	SC-SM, SM, ML, CL-ML	A-2, A-4	0	100	95-100	60-100	30-55	15-30	NP-10
	34-60	Silt loam, silty clay loam, loam.	CL, CL-ML	A-4, A-6, A-7	0-5	90-100	90-100	75-100	50-95	25-50	5-30
Lanona----------	0-8	Sandy loam-------	SM, SC, SC-SM	A-2, A-4	0	100	95-100	70-100	30-50	20-30	NP-10
	8-34	Fine sandy loam, sandy loam.	SM, SC-SM, SC	A-2, A-4	0	100	95-100	60-100	30-50	20-30	NP-10
	34-80	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	90-100	75-100	50-95	25-45	5-20
To--------------- Tonka	0-24	Silty clay loam	CL	A-6, A-7	0-2	100	95-100	90-100	70-90	45-55	20-30
	24-49	Silty clay loam, clay loam, silty clay.	CH, CL	A-6, A-7	0-2	100	95-100	90-100	75-95	50-60	30-40
	49-60	Silty clay loam, clay loam, loam.	CL, CL-ML	A-6, A-7, A-4	0-3	90-100	85-100	60-100	50-90	35-55	15-30
Tr--------------- Trent	0-13	Silty clay loam	CL, CH, ML, MH	A-6, A-7	0	100	100	95-100	90-100	35-55	10-30
	13-35	Silty clay loam	CL, CH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	15-30
	35-60	Silt loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	70-100	30-50	8-20
VaA, VaB:											
Venagro---------	0-9	Loam-------------	ML, CL	A-4, A-6	0	100	100	85-100	60-85	30-40	7-15
	9-28	Clay loam, silt loam, silty clay loam.	CL	A-6, A-7, A-4	0	100	100	90-100	75-90	20-43	9-21
	28-48	Loam, silt loam	CL, ML	A-4, A-6	0	100	100	85-100	60-90	30-40	7-15
	48-80	Clay loam, loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
Svea------------	0-18	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	80-95	60-80	20-38	5-15
	18-28	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	85-100	80-95	60-90	20-45	5-25
	28-80	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	85-100	80-95	60-90	20-50	5-30
VbA, VbB:											
Vienna----------	0-9	Silt loam--------	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	9-17	Silty clay loam, silt loam.	ML, CL	A-6, A-7	0	100	95-100	90-100	85-100	35-50	10-25
	17-32	Clay loam, loam	CL	A-6, A-7	0-5	95-100	90-100	85-100	60-85	30-45	10-20
	32-80	Clay loam, loam	CL	A-6	0-5	90-100	85-100	80-100	55-80	30-40	10-20
Brookings-------	0-9	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	9-24	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	24-30	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	15-25
	30-80	Loam, clay loam	CL	A-6, A-7	0	100	95-100	85-100	70-85	35-50	15-25

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
VnB, VnC:											
Vienna----------	0-9	Silt loam--------	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	9-17	Silty clay loam, silt loam.	ML, CL	A-6, A-7	0	100	95-100	90-100	85-100	35-50	10-25
	17-32	Clay loam, loam	CL	A-6, A-7	0-5	95-100	90-100	85-100	60-85	30-45	10-20
	32-80	Clay loam, loam	CL	A-6	0-5	90-100	85-100	80-100	55-80	30-40	10-20
Buse------------	0-7	Loam-------------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-32	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	32-80	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
W. Water											
Wa:											
Wakonda---------	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-100	30-50	10-25
	8-35	Silt loam, silty clay loam.	CL	A-6, A-7	0	95-100	95-100	90-100	85-100	30-50	10-25
	35-60	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	95-100	95-100	85-95	60-90	30-50	10-25
Chancellor------	0-12	Silty clay loam	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	85-100	35-55	15-25
	12-38	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	38-60	Silty clay loam, clay loam, loam.	CL, CH, ML, MH	A-6, A-7	0	100	100	85-100	70-100	35-55	15-25
Wb--------------- Waubay	0-12	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	12-25	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	25-41	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	41-60	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-95	30-45	5-20
WeA:											
Wentworth-------	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	11-25
	8-27	Silty clay loam, silt loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	80-100	35-55	10-30
	27-60	Silty clay loam, silt loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	85-100	60-100	30-50	5-25
Trent-----------	0-13	Silty clay loam	CL, CH, ML, MH	A-6, A-7	0	100	100	95-100	90-100	35-55	10-30
	13-35	Silty clay loam	CL, CH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	15-30
	35-60	Silt loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	70-100	30-50	8-20
Wo--------------- Worthing	0-10	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	10-45	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	85-100	50-70	22-35
	45-60	Silty clay, silty clay loam, clay loam.	CL, CH, ML, MH	A-7	0	100	95-100	90-100	70-100	40-65	15-30

Table 17.--Physical and Chemical Properties of the Soils

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Aa-----------------	0-6	6-18	1.40-1.60	2.0-6.0	0.13-0.15	6.1-8.4	0-2	Low--------	0.20	3	3	1-4
Allivar	6-15	6-18	1.40-1.60	2.0-6.0	0.11-0.14	6.6-8.4	0-2	Low--------	0.20			
	15-50	2-10	1.40-1.60	20-60	0.02-0.05	7.4-8.4	0-2	Low--------	0.10			
	50-80	1-10	1.40-1.60	20-60	0.02-0.05	7.4-8.4	0-2	Low--------	0.10			
Ar-----------------	0-8	20-26	1.15-1.30	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Low--------	0.24	4	4L	2-4
Arlo	8-15	20-35	1.20-1.40	0.6-2.0	0.15-0.19	7.4-8.4	0-2	Moderate	0.28			
	15-36	20-30	1.35-1.45	0.6-2.0	0.13-0.17	7.4-8.4	0-4	Low--------	0.28			
	36-80	3-10	1.60-1.80	20-60	0.03-0.06	7.4-8.4	0-4	Low--------	0.10			
AvB----------------	0-8	6-18	1.40-1.60	2.0-6.0	0.13-0.15	6.1-8.4	0	Low--------	0.20	3	3	1-4
Arvilla	8-19	6-18	1.40-1.60	2.0-6.0	0.11-0.14	6.6-8.4	0	Low--------	0.20			
	19-60	2-10	1.40-1.60	20-40	0.02-0.05	7.4-8.4	0	Low--------	0.05			
Ba-----------------	0-17	27-35	1.15-1.25	0.06-0.2	0.19-0.22	6.1-7.3	0-2	Moderate	0.37	5	7	4-8
Badger	17-42	35-50	1.25-1.40	0.06-0.2	0.11-0.17	6.1-7.3	0-2	High-------	0.28			
	42-60	20-45	1.40-1.50	0.06-0.2	0.14-0.20	6.6-8.4	0-4	Moderate	0.37			
BbA, BbB-----------	0-7	27-35	1.10-1.50	0.2-0.6	0.17-0.19	5.6-7.8	0-2	Moderate	0.24	5	6	3-6
Barnes	7-18	18-35	1.20-1.60	0.2-0.6	0.15-0.19	6.1-7.8	0-4	Moderate	0.28			
	18-42	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
	42-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
BcB:												
Barnes------------	0-7	15-27	1.10-1.50	0.2-0.6	0.20-0.22	5.6-7.8	0-2	Low--------	0.24	5	6	3-6
	7-18	18-35	1.20-1.60	0.2-0.6	0.15-0.19	6.1-7.8	0-4	Moderate	0.28			
	18-42	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
	42-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
Buse--------------	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	7.4-8.4	0	Low--------	0.28	5	4L	1-3
	7-32	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
	32-80	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
BeA, BeB-----------	0-9	27-35	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	4	7	4-8
Brandt	9-35	25-35	1.20-1.35	0.6-2.0	0.17-0.21	6.1-7.8	0-2	Moderate	0.32			
	35-48	20-30	1.20-1.35	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	48-60	5-10	1.60-1.75	20-60	0.03-0.06	7.4-8.4	0-2	Low--------	0.10			
Bf-----------------	0-9	27-35	1.15-1.25	0.2-0.6	0.19-0.22	5.6-7.3	0	Moderate	0.28	5	7	4-8
Brookings	9-24	27-35	1.20-1.35	0.2-0.6	0.19-0.22	6.6-8.4	0	Moderate	0.32			
	24-30	27-35	1.20-1.35	0.2-0.6	0.17-0.20	7.4-8.4	0	Moderate	0.32			
	30-80	20-35	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			
BgC, BgD:												
Buse--------------	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	7.4-8.4	0	Low--------	0.28	5	4L	1-3
	7-32	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
	32-80	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
Barnes------------	0-7	15-27	1.10-1.50	0.2-0.6	0.20-0.22	5.6-7.8	0-2	Low--------	0.24	5	6	3-6
	7-18	18-35	1.20-1.60	0.2-0.6	0.15-0.19	6.1-7.8	0-4	Moderate	0.28			
	18-42	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
	42-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
BhC, BhE:												
Buse------------	0-7	20-27	1.40-1.50	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Moderate	0.20	5	8	2-4
	7-32	20-30	1.55-1.65	0.2-0.6	0.16-0.20	7.4-8.4	2-8	Moderate	0.28			
	32-80	20-30	1.55-1.65	0.2-0.6	0.16-0.20	7.4-8.4	2-8	Moderate	0.28			
Barnes----------	0-7	18-26	1.20-1.60	0.2-0.6	0.20-0.22	5.6-7.8	0-2	Low-------	0.17	5	8	3-7
	7-18	18-35	1.20-1.60	0.2-0.6	0.15-0.19	6.1-7.8	0-4	Low-------	0.28			
	18-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Low-------	0.37			
BkE:												
Buse------------	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	7.4-8.4	0	Low-------	0.28	5	4L	1-3
	7-32	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
	32-80	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
Lamoure---------	0-28	27-34	1.15-1.25	0.2-0.6	0.19-0.22	7.4-8.4	0-4	Moderate	0.28	5	4L	4-8
	28-57	20-34	1.20-1.35	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.32			
	57-60	20-34	1.25-1.40	0.2-0.6	0.09-0.18	7.4-8.4	0-4	Moderate	0.28			
BoE:												
Buse------------	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	7.4-8.4	0	Low-------	0.28	5	4L	1-3
	7-32	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
	32-80	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
Langhei---------	0-3	28-35	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	0	Low-------	0.28	5	4L	.5-3
	3-14	28-35	1.50-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Low-------	0.32			
	14-80	28-35	1.50-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Low-------	0.32			
BpD:												
Buse------------	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	7.4-8.4	0	Low-------	0.28	5	4L	1-3
	7-32	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
	32-80	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
Poinsett--------	0-8	27-30	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-6
	8-23	20-32	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.32			
	23-62	20-32	1.20-1.35	0.6-2.0	0.18-0.21	7.4-8.4	0-2	Moderate	0.43			
	62-80	25-30	1.50-1.70	0.6-2.0	0.16-0.19	7.4-8.4	0-8	Moderate	0.37			
BrD:												
Buse------------	0-7	20-27	1.40-1.50	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Moderate	0.20	5	8	2-4
	7-32	20-30	1.55-1.65	0.2-0.6	0.16-0.20	7.4-8.4	2-8	Moderate	0.28			
	32-80	20-30	1.55-1.65	0.2-0.6	0.16-0.20	7.4-8.4	2-8	Moderate	0.28			
Poinsett--------	0-8	27-30	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-6
	8-23	20-32	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.32			
	23-62	20-32	1.20-1.35	0.6-2.0	0.18-0.21	7.4-8.4	0-2	Moderate	0.43			
	62-80	25-30	1.50-1.70	0.6-2.0	0.16-0.19	7.4-8.4	0-8	Moderate	0.37			
BsC:												
Buse------------	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	7.4-8.4	0	Low-------	0.28	5	4L	1-3
	7-32	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
	32-80	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
Singsaas--------	0-13	27-35	1.15-1.25	0.2-0.6	0.18-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	5-7
	13-19	27-35	1.20-1.35	0.2-0.6	0.17-0.20	6.6-7.8	0-2	Moderate	0.28			
	19-41	20-30	1.25-1.45	0.2-0.6	0.16-0.20	7.4-8.4	0-2	Moderate	0.37			
	41-80	25-30	1.35-1.60	0.2-0.6	0.17-0.20	7.4-8.4	0-2	Moderate	0.37			
BxE:												
Buse------------	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	7.4-8.4	0	Low-------	0.28	5	4L	1-3
	7-32	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
	32-80	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
BxE:												
Sioux-----------	0-7	10-20	1.30-1.50	20-60	0.10-0.15	6.6-8.4	0-2	Low-------	0.15	2	5	1-3
	7-10	10-20	1.20-1.50	20-60	0.10-0.15	7.4-8.4	0-2	Low-------	0.15			
	10-60	0-10	1.60-1.70	20-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Ca--------------- Castlewood	0-12	40-50	1.15-1.25	0.06-0.2	0.13-0.18	5.6-7.3	0-2	High------	0.28	5	4	4-6
	12-46	35-50	1.20-1.40	0.06-0.2	0.16-0.18	6.6-7.8	2-4	High------	0.28			
	46-80	35-50	1.25-1.45	0.06-0.2	0.16-0.18	7.4-8.4	2-4	High------	0.43			
Ch--------------- Chaska	0-7	20-27	1.30-1.60	0.6-2.0	0.18-0.20	6.6-7.8	0-2	Low-------	0.24	5	4L	2-5
	7-60	18-27	1.40-1.65	0.6-2.0	0.17-0.19	7.4-7.8	0-2	Low-------	0.28			
Cm--------------- Clamo	0-9	40-50	1.15-1.25	0.06-0.2	0.13-0.18	5.6-7.8	0-2	High------	0.28	5	4	4-6
	9-27	35-50	1.15-1.25	0.06-0.2	0.16-0.19	6.1-7.8	2-4	High------	0.37			
	27-60	35-50	1.15-1.25	0.06-0.2	0.16-0.19	7.4-8.4	2-4	High------	0.37			
Co:												
Cubden----------	0-10	27-34	1.15-1.30	0.2-0.6	0.19-0.22	6.6-8.4	0-4	Moderate	0.28	5	4L	1-6
	10-33	18-34	1.30-1.50	0.2-0.6	0.18-0.22	7.4-8.4	0-4	Moderate	0.32			
	33-48	18-34	1.30-1.50	0.2-0.6	0.18-0.22	7.4-8.4	0-4	Moderate	0.43			
	48-60	20-34	1.35-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			
Badger----------	0-17	27-35	1.15-1.25	0.06-0.2	0.19-0.22	6.1-7.3	0-2	Moderate	0.37	5	7	4-8
	17-42	35-50	1.25-1.40	0.06-0.2	0.11-0.17	6.1-7.3	0-2	High------	0.28			
	42-60	20-45	1.40-1.50	0.06-0.2	0.14-0.20	6.6-8.4	0-4	Moderate	0.37			
Ct:												
Cubden----------	0-10	27-34	1.15-1.30	0.2-0.6	0.19-0.22	6.6-8.4	0-4	Moderate	0.28	5	4L	1-6
	10-33	18-34	1.30-1.50	0.2-0.6	0.18-0.22	7.4-8.4	0-4	Moderate	0.32			
	33-48	18-34	1.30-1.50	0.2-0.6	0.18-0.22	7.4-8.4	0-4	Moderate	0.43			
	48-60	20-34	1.35-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			
Tonka-----------	0-24	27-39	1.10-1.50	0.06-0.2	0.18-0.23	5.6-7.8	0	Moderate	0.37	5	7	5-10
	24-49	35-45	1.40-1.65	0.06-0.2	0.14-0.20	5.6-7.8	0-2	High------	0.43			
	49-60	18-39	1.40-1.70	0.06-0.2	0.14-0.19	6.6-8.4	0-4	Moderate	0.37			
DaB-------------- Darnen	0-13	18-27	1.25-1.40	0.6-2.0	0.18-0.20	6.6-7.8	0	Low-------	0.24	5	6	4-8
	13-46	18-30	1.40-1.60	0.6-2.0	0.15-0.19	6.1-7.8	0	Moderate	0.28			
	46-80	18-30	1.55-1.65	0.6-2.0	0.14-0.19	7.4-8.4	0	Moderate	0.32			
DcA, DcB--------- Davis	0-12	18-27	1.20-1.30	0.6-2.0	0.18-0.22	6.1-7.3	0-2	Low-------	0.24	5	6	4-6
	12-48	18-30	1.20-1.35	0.6-2.0	0.12-0.18	6.1-7.8	0-2	Moderate	0.24			
	48-60	18-27	1.25-1.40	0.6-2.0	0.18-0.20	7.4-8.4	0-4	Low-------	0.24			
Dm--------------- Dimo	0-8	27-30	1.25-1.35	0.6-2.0	0.18-0.20	5.6-7.3	0-2	Moderate	0.24	4	6	4-6
	8-31	20-34	1.30-1.40	0.6-2.0	0.16-0.20	6.1-7.8	0-2	Moderate	0.28			
	31-60	5-10	1.60-1.75	20-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Dn--------------- Divide	0-7	15-27	1.10-1.40	0.6-2.0	0.18-0.22	7.4-8.4	0	Low-------	0.24	4	4L	2-8
	7-26	18-30	1.20-1.50	0.6-2.0	0.16-0.19	7.4-8.4	0	Low-------	0.28			
	26-60	0-10	1.30-1.70	20-60	0.03-0.07	7.4-8.4	0	Low-------	0.10			
DoB-------------- Doland	0-8	18-26	1.30-1.45	0.2-0.6	0.20-0.22	6.1-7.3	0-2	Low-------	0.24	5	6	4-6
	8-21	18-26	1.30-1.45	0.2-0.6	0.18-0.20	6.1-7.3	0-2	Low-------	0.32			
	21-60	18-30	1.45-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-4	Moderate	0.32			
DsA:												
Doland----------	0-8	18-26	1.30-1.45	0.2-0.6	0.20-0.22	6.1-7.3	0-2	Low-------	0.24	5	6	4-6
	8-21	18-26	1.30-1.45	0.2-0.6	0.18-0.20	6.1-7.3	0-2	Low-------	0.32			
	21-60	18-30	1.45-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-4	Moderate	0.32			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
DsA:												
Svea------------	0-18	18-26	1.10-1.30	0.2-0.6	0.18-0.20	6.6-7.8	0	Low-------	0.24	5	6	5-8
	18-28	18-28	1.20-1.50	0.2-0.6	0.17-0.22	6.6-7.8	0	Moderate	0.28			
	28-80	18-28	1.20-1.50	0.2-0.6	0.14-0.19	7.4-8.4	0-2	Moderate	0.37			
EaB:												
Egan------------	0-10	27-35	1.15-1.25	0.2-0.6	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	3-6
	10-24	25-35	1.20-1.35	0.2-0.6	0.17-0.20	6.1-7.8	0-2	Moderate	0.43			
	24-57	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.37			
	57-80	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-9.0	2-8	Moderate	0.37			
Ethan-----------	0-8	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Low-------	0.28	5	4L	1-3
	8-40	18-30	1.30-1.45	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Moderate	0.32			
	40-80	18-30	1.45-1.70	0.6-2.0	0.16-0.20	7.4-9.0	2-4	Moderate	0.37			
EeB:												
Egan------------	0-10	27-35	1.15-1.25	0.2-0.6	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	3-6
	10-24	25-35	1.20-1.35	0.2-0.6	0.17-0.20	6.1-7.8	0-2	Moderate	0.43			
	24-57	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.37			
	57-80	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-9.0	2-8	Moderate	0.37			
Wentworth-------	0-8	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0	Moderate	0.28	5	7	3-6
	8-27	25-35	1.15-1.30	0.6-2.0	0.18-0.21	6.1-7.3	0	Moderate	0.43			
	27-60	20-30	1.25-1.40	0.6-2.0	0.17-0.20	7.4-8.4	2-4	Moderate	0.43			
Trent-----------	0-13	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	4-6
	13-35	27-35	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	35-60	20-30	1.30-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
EgA, EgB:												
Egeland---------	0-8	10-18	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	0-2	Low-------	0.20	5	3	1-3
	8-30	10-18	1.30-1.45	2.0-6.0	0.09-0.15	6.1-7.8	0-2	Low-------	0.20			
	30-80	5-10	1.40-1.65	2.0-6.0	0.08-0.10	6.6-8.4	0-2	Low-------	0.17			
Embden----------	0-16	10-18	1.40-1.60	2.0-6.0	0.13-0.18	6.1-7.3	0	Low-------	0.20	5	3	4-7
	16-29	10-18	1.40-1.60	2.0-6.0	0.12-0.17	6.6-7.8	0	Low-------	0.20			
	29-80	5-18	1.40-1.60	2.0-6.0	0.06-0.16	7.4-8.4	0	Low-------	0.24			
EnA-------------- Enet	0-8	20-27	1.20-1.30	0.6-2.0	0.18-0.20	5.6-7.3	0-2	Low-------	0.24	4	6	3-6
	8-22	18-30	1.20-1.35	0.6-2.0	0.18-0.22	6.6-7.8	0-2	Low-------	0.28			
	22-26	15-30	1.20-1.35	0.6-2.0	0.11-0.20	6.6-8.4	0-2	Low-------	0.28			
	26-60	0-5	1.50-1.70	20-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
EsA, EsB--------- Estelline	0-9	20-27	1.10-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Low-------	0.28	4	6	4-8
	9-34	22-30	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.32			
	34-37	20-30	1.25-1.40	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Low-------	0.43			
	37-60	0-5	1.50-1.70	20-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
EtB:												
Estelline-------	0-9	20-27	1.10-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Low-------	0.28	4	6	4-8
	9-34	22-30	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.32			
	34-37	20-30	1.25-1.40	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Low-------	0.43			
	37-60	0-5	1.50-1.70	20-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Sioux-----------	0-7	10-20	1.30-1.50	20-60	0.10-0.15	6.6-8.4	0-2	Low-------	0.15	2	5	1-3
	7-10	10-20	1.20-1.50	20-60	0.10-0.15	7.4-8.4	0-2	Low-------	0.15			
	10-60	0-10	1.60-1.70	20-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
EvD:												
Ethan-----------	0-8	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Low-------	0.28	5	4L	1-3
	8-40	18-30	1.30-1.45	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Moderate	0.32			
	40-80	18-30	1.45-1.70	0.6-2.0	0.16-0.20	7.4-9.0	2-4	Moderate	0.37			
Clarno----------	0-8	20-27	1.20-1.30	0.2-0.6	0.17-0.19	6.1-7.3	0-2	Low-------	0.24	5	6	2-6
	8-15	20-30	1.25-1.40	0.2-0.6	0.16-0.20	6.1-7.8	0-2	Moderate	0.28			
	15-47	20-30	1.25-1.40	0.2-0.6	0.16-0.20	7.4-8.4	0-4	Moderate	0.37			
	47-60	20-30	1.50-1.70	0.2-0.6	0.16-0.20	7.4-9.0	2-8	Moderate	0.37			
EwC:												
Ethan-----------	0-8	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Low-------	0.28	5	4L	1-3
	8-40	18-30	1.30-1.45	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Moderate	0.32			
	40-80	18-30	1.45-1.70	0.6-2.0	0.16-0.20	7.4-9.0	2-4	Moderate	0.37			
Egan------------	0-10	27-35	1.15-1.25	0.2-0.6	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	3-6
	10-24	25-35	1.20-1.35	0.2-0.6	0.17-0.20	6.1-7.8	0-2	Moderate	0.43			
	24-57	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.37			
	57-80	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-9.0	2-8	Moderate	0.37			
Fa--------------- Fairdale	0-6	18-27	1.20-1.40	0.6-2.0	0.20-0.24	7.4-7.8	0	Low-------	0.24	5	4L	3-7
	6-60	18-35	1.20-1.50	0.6-2.0	0.17-0.23	7.4-8.4	0-2	Moderate	0.32			
Fb--------------- Fordtown	0-13	18-25	1.20-1.30	0.6-2.0	0.20-0.22	5.6-7.3	0-2	Low-------	0.24	4	6	3-7
	13-29	18-30	1.10-1.30	0.6-2.0	0.13-0.22	6.1-7.8	0-2	Low-------	0.28			
	29-80	1-10	1.60-1.80	20-60	0.02-0.04	7.4-8.4	0-2	Low-------	0.10			
Fc:												
Fordtown--------	0-13	18-25	1.20-1.30	0.6-2.0	0.20-0.22	5.6-7.3	0-2	Low-------	0.24	4	6	3-7
	13-29	18-30	1.10-1.30	0.6-2.0	0.13-0.22	6.1-7.8	0-2	Low-------	0.28			
	29-80	1-10	1.60-1.80	20-60	0.02-0.04	7.4-8.4	0-2	Low-------	0.10			
Spottswood------	0-10	20-26	1.15-1.35	0.6-2.0	0.18-0.22	6.1-7.3	0-2	Low-------	0.24	4	6	4-8
	10-17	18-30	1.25-1.40	0.6-2.0	0.18-0.22	6.6-8.4	0-2	Moderate	0.28			
	17-26	11-20	1.25-1.45	0.6-2.0	0.12-0.16	6.6-8.4	0-2	Low-------	0.15			
	26-80	2-8	1.50-1.70	20-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
FdA-------------- Fordville	0-7	18-25	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.3	0-2	Low-------	0.24	4	6	3-7
	7-17	18-30	1.25-1.40	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.28			
	17-27	15-30	1.25-1.45	0.6-2.0	0.12-0.18	6.1-8.4	0-2	Low-------	0.28			
	27-60	0-5	1.60-1.80	20-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
FrB:												
Fordville-------	0-7	18-25	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.3	0-2	Low-------	0.24	4	6	3-7
	7-17	18-30	1.25-1.40	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.28			
	17-27	15-30	1.25-1.45	0.6-2.0	0.12-0.18	6.1-8.4	0-2	Low-------	0.28			
	27-60	0-5	1.60-1.80	20-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Renshaw---------	0-7	20-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-------	0.28	3	6	2-4
	7-18	18-27	1.30-1.45	0.6-2.0	0.11-0.18	6.6-8.4	0-2	Low-------	0.28			
	18-60	0-5	1.45-1.65	20-60	0.03-0.06	6.6-8.4	0-2	Low-------	0.10			
Gs--------------- Goldsmith	0-8	27-35	1.35-1.55	0.6-2.0	0.19-0.22	5.1-7.3	0	Moderate	0.28	4	7	3-8
	8-33	20-35	1.25-1.35	0.6-2.0	0.17-0.20	5.6-7.3	0	Moderate	0.32			
	33-48	20-35	1.25-1.50	0.6-2.0	0.16-0.18	7.4-8.4	0-2	Moderate	0.43			
	48-59	18-25	1.20-1.45	0.6-2.0	0.18-0.20	7.4-8.4	0-2	Low-------	0.24			
	59-80	3-10	1.60-1.80	20-60	0.16-0.18	7.4-8.4	0-2	Low-------	0.10			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Hb:												
Hamerly---------	0-13	18-27	1.30-1.60	0.2-0.6	0.18-0.24	6.6-8.4	0-2	Moderate	0.24	5	4L	3-7
	13-31	18-35	1.20-1.60	0.2-0.6	0.15-0.19	7.4-8.4	0-4	Moderate	0.28			
	31-80	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
Badger----------	0-17	27-35	1.15-1.25	0.06-0.2	0.19-0.22	6.1-7.3	0-2	Moderate	0.37	5	7	4-8
	17-42	35-50	1.25-1.40	0.06-0.2	0.11-0.17	6.1-7.3	0-2	High------	0.28			
	42-60	20-45	1.40-1.50	0.06-0.2	0.14-0.20	6.6-8.4	0-4	Moderate	0.37			
Hc:												
Hamerly---------	0-13	18-27	1.30-1.60	0.2-0.6	0.18-0.24	6.6-8.4	0-2	Moderate	0.24	5	4L	3-7
	13-31	18-35	1.20-1.60	0.2-0.6	0.15-0.19	7.4-8.4	0-4	Moderate	0.28			
	31-80	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
Cavour----------	0-7	27-35	1.25-1.35	0.01-0.06	0.17-0.22	6.1-7.8	0-2	Moderate	0.32	2	6	4-6
	7-22	35-50	1.25-1.40	0.01-0.06	0.10-0.16	6.6-9.0	4-16	High------	0.28			
	22-30	25-50	1.24-1.50	0.01-0.06	0.10-0.16	7.4-9.0	8-16	High------	0.37			
	30-80	25-35	1.50-1.75	0.01-0.06	0.11-0.15	7.4-9.0	8-16	Moderate	0.37			
Badger----------	0-17	27-35	1.15-1.25	0.06-0.2	0.19-0.22	6.1-7.3	0-2	Moderate	0.37	5	7	4-8
	17-42	35-50	1.25-1.40	0.06-0.2	0.11-0.17	6.1-7.3	0-2	High------	0.28			
	42-60	20-45	1.40-1.50	0.06-0.2	0.14-0.20	6.6-8.4	0-4	Moderate	0.37			
HeA, HeB--------- Hetland	0-8	35-45	1.20-1.30	0.06-0.2	0.13-0.19	5.6-7.3	0-2	High------	0.37	5	4	4-7
	8-24	35-50	1.20-1.40	0.06-0.2	0.11-0.19	5.6-7.3	0-2	High------	0.37			
	24-42	35-50	1.30-1.40	0.06-0.2	0.11-0.20	7.4-8.4	0-2	High------	0.37			
	42-60	25-40	1.25-1.45	0.06-0.2	0.11-0.20	6.6-8.4	0-4	High------	0.37			
KrA, KrB:												
Kranzburg-------	0-9	27-34	1.15-1.25	0.2-0.6	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	4-8
	9-18	24-34	1.20-1.35	0.2-0.6	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	18-25	24-34	1.20-1.35	0.2-0.6	0.18-0.22	6.6-8.4	0-2	Moderate	0.32			
	25-51	25-30	1.50-1.70	0.2-0.6	0.18-0.20	7.4-8.4	0-4	Moderate	0.37			
	51-80	25-30	1.50-1.70	0.2-0.6	0.18-0.20	7.4-9.0	0-8	Moderate	0.37			
Brookings-------	0-9	27-35	1.15-1.25	0.2-0.6	0.19-0.22	5.6-7.3	0	Moderate	0.28	5	7	4-8
	9-24	27-35	1.20-1.35	0.2-0.6	0.19-0.22	6.6-8.4	0	Moderate	0.32			
	24-30	27-35	1.20-1.35	0.2-0.6	0.17-0.20	7.4-8.4	0	Moderate	0.32			
	30-80	20-35	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			
La--------------- La Prairie	0-14	18-27	1.10-1.40	0.6-2.0	0.17-0.22	6.6-8.4	0	Low-------	0.24	5	6	2-6
	14-39	18-35	1.10-1.50	0.6-2.0	0.17-0.22	6.6-8.4	0	Moderate	0.32			
	39-80	18-35	1.30-1.70	0.6-2.0	0.15-0.22	6.6-8.4	0	Moderate	0.32			
Lc--------------- La Prairie	0-14	18-27	1.10-1.40	0.6-2.0	0.17-0.22	6.6-8.4	0-2	Low-------	0.24	5	6	2-6
	14-39	18-35	1.10-1.50	0.6-2.0	0.17-0.22	6.6-8.4	0-2	Moderate	0.28			
	39-80	18-35	1.30-1.70	0.6-2.0	0.15-0.22	6.6-8.4	0-2	Moderate	0.28			
Ld--------------- LaDelle	0-20	20-27	1.15-1.30	0.6-2.0	0.20-0.22	6.1-7.8	0-2	Low-------	0.28	5	6	3-7
	20-44	25-35	1.20-1.35	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.32			
	44-80	25-50	1.30-1.40	0.6-2.0	0.12-0.22	7.4-8.4	0-4	Moderate	0.28			
Le--------------- Lamo	0-16	18-35	1.30-1.60	0.2-0.6	0.19-0.23	7.4-8.4	0	Moderate	0.32	5	4L	3-6
	16-60	25-35	1.30-1.50	0.2-0.6	0.18-0.22	7.4-8.4	0	Moderate	0.43			
Lk--------------- Lamoure	0-28	27-34	1.15-1.25	0.2-0.6	0.19-0.22	7.4-8.4	0-4	Moderate	0.28	5	4L	4-8
	28-57	25-34	1.20-1.35	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.32			
	57-60	25-34	1.20-1.35	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.43			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Lm:												
Lamoure---------	0-28	27-34	1.15-1.25	0.2-0.6	0.19-0.22	7.4-8.4	0-4	Moderate	0.28	5	4L	4-8
	28-57	20-34	1.20-1.35	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.32			
	57-60	20-34	1.25-1.40	0.2-0.6	0.09-0.18	7.4-8.4	0-4	Moderate	0.28			
Rauville--------	0-24	27-35	1.10-1.25	0.2-0.6	0.19-0.22	7.4-8.4	0-2	Moderate	0.28	5	4L	4-7
	24-48	20-45	1.10-1.30	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.32			
	48-60	5-15	1.20-1.35	0.2-0.6	0.08-0.15	6.6-8.4	0-4	Low-------	0.10			
LnB:												
Lanona----------	0-8	10-20	1.25-1.35	2.0-6.0	0.13-0.18	6.1-7.3	0	Low-------	0.20	5	3	2-4
	8-34	10-18	1.30-1.45	2.0-6.0	0.12-0.17	6.6-7.8	0	Low-------	0.24			
	34-80	20-35	1.35-1.60	0.2-0.6	0.16-0.20	7.4-8.4	0-4	Moderate	0.32			
Swenoda---------	0-8	10-20	1.25-1.35	2.0-6.0	0.11-0.17	6.1-7.3	0-2	Low-------	0.20	5	3	2-7
	8-34	10-18	1.30-1.45	2.0-6.0	0.11-0.17	6.6-7.8	0-2	Low-------	0.20			
	34-60	20-35	1.35-1.65	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.43			
Lo--------------- Lowe	0-10	24-27	1.20-1.30	0.6-2.0	0.17-0.20	6.6-8.4	0-2	Low-------	0.24	5	4L	5-8
	10-36	24-35	1.25-1.35	0.6-2.0	0.15-0.19	7.4-8.4	0-2	Moderate	0.28			
	36-80	10-30	1.35-1.50	0.6-2.0	0.13-0.19	7.4-8.4	0-4	Moderate	0.28			
Lr:												
Lowe------------	0-10	24-27	1.20-1.30	0.6-2.0	0.17-0.20	6.6-8.4	0-2	Low-------	0.24	5	4L	5-8
	10-36	24-35	1.25-1.35	0.6-2.0	0.15-0.19	7.4-8.4	0-2	Moderate	0.28			
	36-80	10-30	1.35-1.50	0.6-2.0	0.13-0.19	7.4-8.4	0-4	Moderate	0.28			
Ludden----------	0-22	40-60	1.10-1.30	0.06-0.2	0.16-0.18	6.1-8.4	0-4	High------	0.28	5	4	4-9
	22-40	40-60	1.20-1.50	0.06-0.2	0.13-0.16	7.9-8.4	0-4	High------	0.28			
	40-60	35-60	1.20-1.50	0.06-0.2	0.13-0.16	7.9-8.4	0-8	High------	0.32			
Ls--------------- Ludden	0-22	40-60	1.10-1.30	0.06-0.2	0.16-0.18	6.1-8.4	0-4	High------	0.28	5	4	4-9
	22-40	40-60	1.20-1.50	0.06-0.2	0.13-0.16	7.9-8.4	0-4	High------	0.28			
	40-60	35-60	1.20-1.50	0.06-0.2	0.13-0.16	7.9-8.4	0-8	High------	0.32			
Lu:												
Ludden, saline--	0-22	40-60	1.10-1.30	0.06-0.2	0.12-0.14	6.1-8.4	4-8	High------	0.28	5	4	4-9
	22-40	40-60	1.20-1.50	0.06-0.2	0.06-0.08	7.9-8.4	8-16	High------	0.28			
	40-60	35-60	1.20-1.50	0.06-0.2	0.06-0.08	7.9-8.4	8-16	High------	0.32			
Ludden----------	0-22	40-60	1.10-1.30	0.06-0.2	0.16-0.18	6.1-8.4	0-4	High------	0.28	5	4	4-9
	22-40	40-60	1.20-1.50	0.06-0.2	0.13-0.16	7.9-8.4	0-4	High------	0.28			
	40-60	35-60	1.20-1.50	0.06-0.2	0.13-0.16	7.9-8.4	0-8	High------	0.32			
M-W. Miscellaneous water												
MaB:												
Maddock---------	0-7	5-15	1.35-1.45	6.0-20	0.13-0.18	6.6-7.8	0	Low-------	0.20	5	3	1-3
	7-80	3-9	1.35-1.45	6.0-20	0.05-0.13	6.6-8.4	0	Low-------	0.17			
Egeland---------	0-8	10-18	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	0-2	Low-------	0.20	5	3	1-3
	8-21	10-18	1.30-1.45	2.0-6.0	0.09-0.15	6.1-7.8	0-2	Low-------	0.20			
	21-80	5-10	1.40-1.65	2.0-6.0	0.08-0.10	6.6-8.4	0-2	Low-------	0.17			
MaC:												
Maddock---------	0-7	5-15	1.35-1.45	6.0-20	0.13-0.18	6.6-7.8	0	Low-------	0.20	5	3	1-3
	7-80	3-9	1.35-1.45	6.0-20	0.05-0.13	6.6-8.4	0	Low-------	0.17			
Egeland---------	0-8	10-18	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	0-2	Low-------	0.20	5	3	1-3
	8-30	10-18	1.30-1.45	2.0-6.0	0.09-0.15	6.1-7.8	0-2	Low-------	0.20			
	30-80	5-10	1.40-1.65	2.0-6.0	0.08-0.10	6.6-8.4	0-2	Low-------	0.17			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
MeA:												
Maddock---------	0-7	5-15	1.35-1.45	6.0-20	0.13-0.18	6.6-7.8	0	Low-------	0.20	5	3	1-3
	7-80	3-9	1.35-1.45	6.0-20	0.05-0.13	6.6-8.4	0	Low-------	0.17			
Embden----------	0-16	10-18	1.40-1.60	2.0-6.0	0.13-0.18	6.1-7.3	0	Low-------	0.20	5	3	4-7
	16-29	10-18	1.40-1.60	2.0-6.0	0.12-0.17	6.6-7.8	0	Low-------	0.20			
	29-80	5-18	1.40-1.60	2.0-6.0	0.06-0.16	7.4-8.4	0	Low-------	0.24			
Mr--------------- Marysland	0-9	18-30	1.20-1.30	0.6-2.0	0.17-0.22	7.9-8.4	0-2	Moderate	0.24	4	4L	1-6
	9-38	18-30	1.35-1.50	0.6-2.0	0.15-0.19	7.9-8.4	0-2	Moderate	0.32			
	38-80	1-5	1.55-1.65	20-60	0.02-0.07	7.9-8.4	0-2	Low-------	0.10			
Mt:												
McIntosh--------	0-8	18-27	1.35-1.50	0.2-0.6	0.18-0.22	7.4-8.4	0-4	Low-------	0.24	5	4L	4-7
	8-31	18-35	1.40-1.50	0.2-0.6	0.16-0.22	7.4-8.4	0-4	Moderate	0.43			
	31-80	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
Badger----------	0-17	27-35	1.15-1.25	0.06-0.2	0.19-0.22	6.1-7.3	0-2	Moderate	0.37	5	7	4-8
	17-42	35-50	1.25-1.40	0.06-0.2	0.11-0.17	6.1-7.3	0-2	High------	0.28			
	42-60	20-45	1.40-1.50	0.06-0.2	0.14-0.20	6.6-8.4	0-4	Moderate	0.37			
Mu:												
McIntosh--------	0-8	18-27	1.35-1.50	0.2-0.6	0.18-0.22	7.4-8.4	0-4	Low-------	0.24	5	4L	4-7
	8-31	18-35	1.40-1.50	0.2-0.6	0.16-0.22	7.4-8.4	0-4	Moderate	0.43			
	31-80	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
Lamoure---------	0-28	27-34	1.15-1.25	0.2-0.6	0.19-0.22	7.4-8.4	0-4	Moderate	0.28	5	4L	4-8
	28-57	20-34	1.20-1.35	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.32			
	57-60	20-34	1.25-1.40	0.2-0.6	0.09-0.18	7.4-8.4	0-4	Moderate	0.28			
Mw--------------- Minnewaukan	0-5	1-10	1.35-1.50	6.0-20	0.04-0.10	6.6-7.8	2-4	Low-------	0.17	5	2	1-3
	5-60	1-5	1.40-1.70	6.0-20	0.04-0.12	7.4-8.4	2-4	Low-------	0.15			
Mz:												
Moritz----------	0-15	20-27	1.20-1.30	0.6-2.0	0.17-0.20	6.6-8.4	0-2	Low-------	0.24	5	4L	3-6
	15-80	20-35	1.25-1.35	0.6-2.0	0.15-0.19	7.4-9.0	0-2	Moderate	0.28			
Lamoure---------	0-28	27-34	1.15-1.25	0.2-0.6	0.19-0.22	7.4-8.4	0-4	Moderate	0.28	5	4L	4-8
	28-57	20-34	1.20-1.35	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.32			
	57-60	20-34	1.25-1.40	0.2-0.6	0.09-0.18	7.4-8.4	0-4	Moderate	0.28			
Od--------------- Oldham	0-9	35-40	1.15-1.30	0.06-0.2	0.13-0.19	6.6-7.8	0-4	High------	0.37	5	4	4-7
	9-40	35-45	1.25-1.40	0.06-0.2	0.14-0.20	7.4-8.4	0-4	High------	0.37			
	40-80	20-40	1.30-1.50	0.06-0.2	0.14-0.20	7.4-8.4	0-2	Moderate	0.43			
Og--------------- Orthents	0-3	10-20	1.25-1.40	2.0-6.0	0.11-0.20	6.1-7.8	0-2	Low-------	0.20	3	5	.5-3
	3-80	0-5	1.60-1.80	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Or--------------- Orthents	0-80	27-35	1.20-1.50	0.2-0.6	0.18-0.23	6.6-8.4	0-2	Moderate	0.28	5	4L	1-3
Pa--------------- Parnell	0-17	27-40	1.20-1.30	0.06-0.2	0.18-0.22	6.1-7.8	0-2	Moderate	0.37	5	7	6-10
	17-45	35-60	1.20-1.30	0.06-0.2	0.13-0.19	6.1-7.8	0-2	High------	0.37			
	45-60	35-45	1.20-1.40	0.06-0.2	0.11-0.19	6.6-8.4	0-2	High------	0.43			
PbB, PbC:												
Poinsett--------	0-8	27-30	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-6
	8-23	20-32	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.32			
	23-62	20-32	1.20-1.35	0.6-2.0	0.18-0.21	7.4-8.4	0-2	Moderate	0.43			
	62-80	25-30	1.50-1.70	0.6-2.0	0.16-0.19	7.4-8.4	0-8	Moderate	0.37			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
PbB, PbC:												
Buse------------	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	7.4-8.4	0	Low-------	0.28	5	4L	1-3
	7-32	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
	32-80	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
Waubay----------	0-12	27-35	1.35-1.45	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-8
	12-25	20-35	1.35-1.45	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	25-41	20-35	1.35-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	41-60	20-35	1.40-1.50	0.6-2.0	0.16-0.18	7.4-8.4	0-4	Moderate	0.43			
PwA, PwB:												
Poinsett--------	0-8	27-30	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-6
	8-23	20-32	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.32			
	23-62	20-32	1.20-1.35	0.6-2.0	0.18-0.21	7.4-8.4	0-2	Moderate	0.43			
	62-80	25-30	1.50-1.70	0.6-2.0	0.16-0.19	7.4-8.4	0-8	Moderate	0.37			
Waubay----------	0-12	27-35	1.35-1.45	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-8
	12-25	20-35	1.35-1.45	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	25-41	20-35	1.35-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	41-60	20-35	1.40-1.50	0.6-2.0	0.16-0.18	7.4-8.4	0-4	Moderate	0.43			
Ra, Rp----------- Rauville	0-24	27-35	1.10-1.25	0.2-0.6	0.19-0.22	7.4-8.4	0-2	Moderate	0.28	5	4L	4-7
	24-48	20-45	1.10-1.30	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.32			
	48-60	5-15	1.20-1.35	0.2-0.6	0.08-0.15	6.6-8.4	0-4	Low-------	0.10			
RsB, RsC:												
Renshaw---------	0-7	20-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-------	0.28	3	6	2-4
	7-18	18-27	1.30-1.45	0.6-2.0	0.11-0.18	6.6-8.4	0-2	Low-------	0.28			
	18-60	0-5	1.45-1.65	20-60	0.03-0.06	6.6-8.4	0-2	Low-------	0.10			
Sioux-----------	0-7	10-20	1.30-1.50	20-60	0.10-0.15	6.6-8.4	0-2	Low-------	0.15	2	5	1-3
	7-10	10-20	1.20-1.50	20-60	0.10-0.15	7.4-8.4	0-2	Low-------	0.15			
	10-60	0-10	1.60-1.70	20-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Rw--------------- Renwash	0-7	18-27	1.20-1.30	0.6-2.0	0.20-0.22	5.6-7.8	0-2	Low-------	0.28	3	6	2-4
	7-17	18-27	1.30-1.45	0.6-2.0	0.12-0.19	5.6-8.4	0-2	Low-------	0.28			
	17-80	1-10	1.45-1.65	20-60	0.02-0.04	5.6-8.4	0-2	Low-------	0.10			
SbB:												
Singsaas--------	0-13	27-35	1.15-1.25	0.2-0.6	0.18-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	5-7
	13-19	27-35	1.20-1.35	0.2-0.6	0.17-0.20	6.6-7.8	0-2	Moderate	0.28			
	19-41	20-30	1.25-1.45	0.2-0.6	0.16-0.20	7.4-8.4	0-2	Moderate	0.37			
	41-80	25-30	1.35-1.60	0.2-0.6	0.17-0.20	7.4-8.4	0-2	Moderate	0.37			
Buse------------	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	7.4-8.4	0	Low-------	0.28	5	4L	1-3
	7-32	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
	32-80	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
ScA, ScB:												
Singsaas--------	0-13	27-35	1.15-1.25	0.2-0.6	0.18-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	5-7
	13-19	27-35	1.20-1.35	0.2-0.6	0.17-0.20	6.6-7.8	0-2	Moderate	0.28			
	19-41	20-30	1.25-1.45	0.2-0.6	0.16-0.20	7.4-8.4	0-2	Moderate	0.37			
	41-80	25-30	1.35-1.60	0.2-0.6	0.17-0.20	7.4-8.4	0-2	Moderate	0.37			
Waubay----------	0-12	27-35	1.35-1.45	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-8
	12-25	20-35	1.35-1.45	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	25-41	20-35	1.35-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	41-60	20-35	1.40-1.50	0.6-2.0	0.16-0.18	7.4-8.4	0-4	Moderate	0.43			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
ShD, ShE:												
Sioux-----------	0-7	10-20	1.30-1.50	20-60	0.10-0.15	6.6-8.4	0-2	Low-------	0.15	2	5	1-3
	7-10	10-20	1.20-1.50	20-60	0.10-0.15	7.4-8.4	0-2	Low-------	0.15			
	10-60	0-10	1.60-1.70	20-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Renshaw---------	0-7	20-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-------	0.28	3	6	2-4
	7-18	18-27	1.30-1.45	0.6-2.0	0.11-0.18	6.6-8.4	0-2	Low-------	0.28			
	18-60	0-5	1.45-1.65	20-60	0.03-0.06	6.6-8.4	0-2	Low-------	0.10			
So--------------- Southam	0-12	27-40	1.10-1.40	0.06-0.2	0.18-0.23	6.6-8.4	2-8	Moderate	0.37	5	4L	5-20
	12-80	35-50	1.20-1.50	0.06-0.2	0.14-0.20	6.6-8.4	2-8	High------	0.28			
Sp--------------- Spottswood	0-10	20-26	1.15-1.35	0.6-2.0	0.18-0.22	6.1-7.3	0-2	Low-------	0.24	4	6	4-8
	10-17	18-30	1.25-1.40	0.6-2.0	0.18-0.22	6.6-8.4	0-2	Moderate	0.28			
	17-26	11-20	1.25-1.45	0.6-2.0	0.12-0.16	6.6-8.4	0-2	Low-------	0.15			
	26-80	2-8	1.50-1.70	20-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
SrA, SrB--------- Strayhoss	0-8	18-27	1.15-1.30	0.6-2.0	0.18-0.22	5.6-7.3	0-2	Low-------	0.24	4	6	3-6
	8-24	18-30	1.15-1.30	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	24-30	18-30	1.25-1.35	0.6-2.0	0.15-0.20	7.4-8.4	0-2	Moderate	0.43			
	30-80	5-10	1.40-1.60	0.6-2.0	0.06-0.20	7.4-8.4	0-2	Low-------	0.17			
StB:												
Strayhoss-------	0-8	18-27	1.15-1.30	0.6-2.0	0.18-0.22	5.6-7.3	0-2	Low-------	0.24	4	6	3-6
	8-24	18-30	1.15-1.30	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	24-30	18-30	1.25-1.35	0.6-2.0	0.15-0.20	7.4-8.4	0-2	Moderate	0.43			
	30-80	5-10	1.40-1.60	0.6-2.0	0.06-0.20	7.4-8.4	0-2	Low-------	0.17			
Maddock---------	0-7	5-15	1.35-1.45	6.0-20	0.13-0.18	6.6-7.8	0	Low-------	0.20	5	3	1-3
	7-80	3-9	1.35-1.45	6.0-20	0.05-0.13	6.6-8.4	0	Low-------	0.17			
SvA-------------- Svea	0-18	18-26	1.10-1.30	0.2-0.6	0.18-0.20	6.6-7.8	0	Low-------	0.24	5	6	5-8
	18-28	18-28	1.20-1.50	0.2-0.6	0.17-0.22	6.6-7.8	0	Moderate	0.28			
	28-80	18-28	1.20-1.50	0.2-0.6	0.14-0.19	7.4-8.4	0-2	Moderate	0.37			
SwA:												
Swenoda---------	0-8	10-20	1.25-1.35	2.0-6.0	0.11-0.17	6.1-7.3	0-2	Low-------	0.20	5	3	2-7
	8-34	10-18	1.30-1.45	2.0-6.0	0.11-0.17	6.6-7.8	0-2	Low-------	0.20			
	34-60	20-35	1.35-1.65	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.43			
Lanona----------	0-8	10-20	1.25-1.35	2.0-6.0	0.13-0.18	6.1-7.3	0	Low-------	0.20	5	3	2-4
	8-34	10-18	1.30-1.45	2.0-6.0	0.12-0.17	6.6-7.8	0	Low-------	0.24			
	34-80	20-35	1.35-1.60	0.2-0.6	0.16-0.20	7.4-8.4	0-4	Moderate	0.32			
To--------------- Tonka	0-24	27-39	1.10-1.50	0.06-0.2	0.18-0.23	5.6-7.8	0	Moderate	0.37	5	7	5-10
	24-49	35-45	1.40-1.65	0.06-0.2	0.14-0.20	5.6-7.8	0-2	High------	0.43			
	49-60	18-39	1.40-1.70	0.06-0.2	0.14-0.19	6.6-8.4	0-4	Moderate	0.37			
Tr--------------- Trent	0-13	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	4-6
	13-35	27-35	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	35-60	20-30	1.30-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
VaA, VaB:												
Venagro---------	0-9	18-27	1.25-1.40	0.2-0.6	0.18-0.22	5.1-7.3	0	Moderate	0.24	5	6	2-6
	9-28	18-30	1.20-1.35	0.2-0.6	0.16-0.21	5.6-7.8	0	Moderate	0.32			
	28-48	18-27	1.30-1.50	0.2-0.6	0.18-0.22	7.4-8.4	0	Moderate	0.32			
	48-80	18-35	1.50-1.75	0.2-0.6	0.14-0.19	7.4-8.4	0-8	Moderate	0.37			
Svea------------	0-18	18-26	1.10-1.30	0.2-0.6	0.18-0.20	6.6-7.8	0	Low-------	0.24	5	6	5-8
	18-28	18-28	1.20-1.50	0.2-0.6	0.17-0.22	6.6-7.8	0	Moderate	0.28			
	28-80	18-28	1.20-1.50	0.2-0.6	0.14-0.19	7.4-8.4	0-2	Moderate	0.37			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
VbA, VbB:												
Vienna----------	0-9	22-26	1.10-1.25	0.2-0.6	0.20-0.22	6.1-7.3	0	Low-------	0.28	5	6	3-8
	9-17	24-32	1.20-1.35	0.2-0.6	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	17-32	25-32	1.35-1.55	0.2-0.6	0.16-0.20	6.6-8.4	0-2	Moderate	0.37			
	32-80	20-32	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	2-4	Moderate	0.37			
Brookings-------	0-9	27-35	1.15-1.25	0.2-0.6	0.19-0.22	5.6-7.3	0	Moderate	0.28	5	7	4-8
	9-24	27-35	1.20-1.35	0.2-0.6	0.19-0.22	6.6-8.4	0	Moderate	0.32			
	24-30	27-35	1.20-1.35	0.2-0.6	0.17-0.20	7.4-8.4	0	Moderate	0.32			
	30-80	20-35	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			
VnB, VnC:												
Vienna----------	0-9	22-26	1.10-1.25	0.2-0.6	0.20-0.22	6.1-7.3	0	Low-------	0.28	5	6	3-8
	9-17	24-32	1.20-1.35	0.2-0.6	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	17-32	25-32	1.35-1.55	0.2-0.6	0.16-0.20	6.6-8.4	0-2	Moderate	0.37			
	32-80	20-32	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	2-4	Moderate	0.37			
Buse------------	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	7.4-8.4	0	Low-------	0.28	5	4L	1-3
	7-32	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
	32-80	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0	Moderate	0.37			
W.												
Water												
Wa:												
Wakonda---------	0-8	27-30	1.15-1.30	0.6-2.0	0.19-0.22	6.6-8.4	2-4	Moderate	0.28	5	4L	3-6
	8-35	20-33	1.20-1.35	0.6-2.0	0.14-0.17	7.4-8.4	2-4	Moderate	0.43			
	35-60	20-30	1.30-1.50	0.6-2.0	0.16-0.20	7.4-8.4	4-8	Moderate	0.43			
Chancellor------	0-12	30-40	1.15-1.25	0.06-0.2	0.13-0.19	6.1-7.3	0-2	High------	0.37	5	7	4-6
	12-38	35-55	1.20-1.35	0.06-0.2	0.11-0.19	6.1-7.8	0-2	High------	0.28			
	38-60	25-40	1.35-1.50	0.06-0.2	0.14-0.20	7.4-8.4	2-4	High------	0.43			
Wb--------------- Waubay	0-12	27-35	1.35-1.45	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-8
	12-25	20-35	1.35-1.45	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	25-41	20-35	1.35-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	41-60	20-35	1.40-1.50	0.6-2.0	0.16-0.18	7.4-8.4	0-4	Moderate	0.43			
WeA:												
Wentworth-------	0-8	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0	Moderate	0.28	5	7	3-6
	8-27	25-35	1.15-1.30	0.6-2.0	0.18-0.21	6.1-7.3	0	Moderate	0.43			
	27-60	20-30	1.25-1.40	0.6-2.0	0.17-0.20	7.4-8.4	2-4	Moderate	0.43			
Trent-----------	0-13	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	4-6
	13-35	27-35	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	35-60	20-30	1.30-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
Wo--------------- Worthing	0-10	35-40	1.15-1.25	0.06-0.2	0.19-0.22	5.6-7.3	0-2	High------	0.37	5	4	3-5
	10-45	40-60	1.25-1.40	0.06-0.2	0.13-0.18	6.1-7.3	0-2	High------	0.28			
	45-60	30-50	1.35-1.50	0.06-0.2	0.11-0.17	6.6-8.4	2-8	High------	0.32			

Table 18.--Soil and Water Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
Aa----------------- Allivar	B	Rare--------	---	---	3.5-6.0	Apparent	Mar-Jun	Low------	Moderate	Low.
Ar----------------- Arlo	B	Occasional--	Brief-----	Mar-Oct	0-1.5	Apparent	Oct-Jul	High-----	High-----	Moderate.
AvB---------------- Arvilla	B	None--------	---	---	>6.0	---	---	Low------	Moderate	Low.
Ba----------------- Badger	C	Frequent----	Brief-----	Mar-Oct	0-3.0	Perched	Oct-Jun	High-----	High-----	Low.
BbA, BbB----------- Barnes	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Low.
BcB:										
Barnes-----------	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Low.
Buse-------------	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Low.
BeA, BeB----------- Brandt	B	None--------	---	---	>6.0	---	---	High-----	Moderate	Low.
Bf----------------- Brookings	B	None--------	---	---	3.0-5.0	Perched	Oct-Jul	High-----	High-----	Moderate.
BgC, BgD:										
Buse-------------	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Low.
Barnes-----------	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Low.
BhC, BhE:										
Buse-------------	B	None--------	---	---	>6.0	---	---	Moderate	High-----	Moderate.
Barnes-----------	B	None--------	---	---	>6.0	---	---	Moderate	High-----	Low.
BkE:										
Buse-------------	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Low.
Lamoure----------	C	Frequent----	Brief-----	Mar-Oct	0-1.5	Apparent	Oct-Jun	High-----	High-----	Moderate.
BoE:										
Buse-------------	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Low.
Langhei----------	B	None--------	---	---	>6.0	---	---	Moderate	Moderate	Low.
BpD:										
Buse-------------	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Low.
Poinsett---------	B	None--------	---	---	>6.0	---	---	High-----	High-----	Low.
BrD:										
Buse-------------	B	None--------	---	---	>6.0	---	---	Moderate	High-----	Moderate.
Poinsett---------	B	None--------	---	---	>6.0	---	---	High-----	High-----	Low.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
BsC:										
Buse	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Singsaas	B	None	---	---	>6.0	---	---	Moderate	High	Low.
BxE:										
Buse	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Sioux	A	None	---	---	>6.0	---	---	Low	Low	Low.
Ca Castlewood	C/D	Occasional	Long	Mar-Jun	0-1.5	Apparent	Oct-Jun	High	High	High.
Ch Chaska	B/D	Frequent	Long	Mar-Jun	1.5-2.5	Apparent	Nov-Jun	High	High	Low.
Cm Clamo	C/D	Occasional	Long	Mar-Jun	0.5-1.5	Apparent	Oct-Jun	High	High	High.
Co:										
Cubden	C	None	---	---	1.5-3.5	Apparent	Apr-Jun	High	High	Low.
Badger	C	Frequent	Brief	Mar-Oct	0-3.0	Perched	Oct-Jun	High	High	Low.
Ct:										
Cubden	C	None	---	---	1.5-3.5	Apparent	Apr-Jun	High	High	Low.
Tonka	C/D	None	---	---	+1-1.5	Apparent	Apr-Jun	High	High	Low.
DaB Darnen	B	None	---	---	>6.0	---	---	Moderate	High	Low.
DcA Davis	B	Rare	---	---	3.0-5.0	Apparent	Mar-Jun	Moderate	Moderate	Low.
DcB Davis	B	None	---	---	>6.0	---	---	Moderate	Moderate	Low.
Dm Dimo	B	Occasional	Brief	Mar-Oct	1.5-3.0	Apparent	Mar-Jun	High	High	Low.
Dn Divide	B	Occasional	Brief	Apr-Jun	1.5-3.5	Apparent	Apr-Jun	Moderate	High	Low.
DoB Doland	B	None	---	---	>6.0	---	---	Moderate	High	Moderate.
DsA:										
Doland	B	None	---	---	>6.0	---	---	Moderate	High	Moderate.
Svea	B	None	---	---	3.0-5.0	Apparent	Apr-Jun	Moderate	High	Low.
EaB:										
Egan	B	None	---	---	>6.0	---	---	High	High	Moderate.
Ethan	B	None	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
EeB:										
Egan	B	None	---	---	>6.0	---	---	High	High	Moderate.
Wentworth	B	None	---	---	>6.0	---	---	High	High	Low.
Trent	B	None	---	---	3.5-5.0	Perched	Mar-Jun	High	Moderate	Low.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
EgA, EgB:										
Egeland	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
Embden	B	None	---	---	3.5-5.0	Apparent	Apr-Jun	Moderate	High	Low.
EnA Enet	B	Rare	---	---	3.5-6.0	Apparent	Mar-Jun	Low	Moderate	Low.
EsA, EsB Estelline	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
EtB:										
Estelline	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
Sioux	A	None	---	---	>6.0	---	---	Low	Low	Low.
EvD:										
Ethan	B	None	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
Clarno	B	None	---	---	>6.0	---	---	Moderate	High	Moderate.
EwC:										
Ethan	B	None	---	---	>6.0	---	---	Moderate	Moderate	Moderate.
Egan	B	None	---	---	>6.0	---	---	High	High	Moderate.
Fa Fairdale	B	Frequent	Brief	Mar-Jun	3.0-5.0	Apparent	Apr-Jun	Moderate	Moderate	Low.
Fb Fordtown	B	Rare	---	---	3.5-6.0	Apparent	Mar-Jun	Low	Moderate	Low.
Fc:										
Fordtown	B	Rare	---	---	3.5-6.0	Apparent	Mar-Jun	Low	Moderate	Low.
Spottswood	B	Occasional	Brief	Mar-Jun	1.5-3.0	Apparent	Oct-Jun	Moderate	High	Low.
FdA Fordville	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
FrB:										
Fordville	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
Renshaw	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
Gs Goldsmith	B	None	---	---	3.0-5.0	Apparent	Oct-Jun	High	Moderate	Low.
Hb:										
Hamerly	C	None	---	---	1.5-3.5	Apparent	Apr-Jun	High	High	Low.
Badger	C	Frequent	Brief	Mar-Oct	0-3.0	Perched	Oct-Jun	High	High	Low.
Hc:										
Hamerly	C	None	---	---	1.5-3.5	Apparent	Apr-Jun	High	High	Low.
Cavour	D	None	---	---	3.5-5.0	Apparent	Apr-Jun	Moderate	High	Moderate.
Badger	C	Frequent	Brief	Mar-Oct	0-3.0	Perched	Oct-Jun	High	High	Low.
HeA, HeB Hetland	C	None	---	---	>6.0	---	---	Moderate	High	Moderate.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
KrA, KrB:										
Kranzburg	B	None	---	---	>6.0	---	---	High	High	Moderate.
Brookings	B	None	---	---	3.0-5.0	Perched	Oct-Jul	High	High	Moderate.
La La Prairie	B	Occasional	Brief	Mar-Jun	3.5-5.0	Apparent	Mar-Jun	Moderate	Moderate	Low.
Lc La Prairie	B	Rare	---	---	3.5-5.0	Apparent	Mar-Jun	Moderate	Moderate	Low.
Ld LaDelle	B	Occasional	Brief	Apr-Jun	3.5-5.0	Apparent	Oct-Jun	High	High	Low.
Le Lamo	C	Occasional	Brief	Mar-Aug	1.0-3.0	Apparent	Nov-May	High	High	Low.
Lk Lamoure	C	Occasional	Brief	Mar-Jun	0-2.0	Apparent	Oct-Jun	High	High	Moderate.
Lm:										
Lamoure	C	Frequent	Brief	Mar-Oct	0-1.5	Apparent	Oct-Jun	High	High	Moderate.
Rauville	D	Frequent	Long	Mar-Oct	0-0.5	Apparent	Jan-Dec	High	High	Moderate.
LnB:										
Lanona	B	None	---	---	>6.0	---	---	Moderate	High	Moderate.
Swenoda	B	None	---	---	2.5-4.0	Perched	Mar-Jun	Moderate	High	Moderate.
Lo Lowe	B/D	Occasional	Brief	Mar-Nov	0-1.5	Apparent	Jan-Dec	High	High	Low.
Lr:										
Lowe	B/D	Occasional	Brief	Mar-Nov	0-1.5	Apparent	Jan-Dec	High	High	Low.
Ludden	D	Frequent	Brief or long.	Mar-Jul	+.5-1.5	Apparent	Mar-Jul	High	High	Low.
Ls Ludden	D	Frequent	Brief or long.	Mar-Jul	+.5-1.5	Apparent	Mar-Jul	High	High	Low.
Lu:										
Ludden, saline	D	Frequent	Brief or long.	Mar-Jun	+.5-1.5	Apparent	Mar-Jul	High	High	Moderate.
Ludden	D	Frequent	Brief or long.	Mar-Jul	+.5-1.5	Apparent	Mar-Jul	High	High	Low.
M-W. Miscellaneous water										
MaB, MaC:										
Maddock	A	None	---	---	>6.0	---	---	Low	Moderate	Low.
Egeland	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
MeA:										
Maddock	A	None	---	---	>6.0	---	---	Low	Moderate	Low.
Embden	B	None	---	---	3.5-5.0	Apparent	Apr-Jun	Moderate	High	Low.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
Mr: Marysland	B/D	Occasional	Brief	Apr-Sep	0.5-1.5	Apparent	Nov-Jul	High	High	Low.
Mt:										
McIntosh	B	None	---	---	1.5-2.5	Apparent	Apr-Nov	High	High	Low.
Badger	C	Frequent	Brief	Mar-Oct	0-3.0	Perched	Oct-Jun	High	High	Low.
Mu:										
McIntosh	B	None	---	---	1.5-2.5	Apparent	Apr-Nov	High	High	Low.
Lamoure	C	Frequent	Brief	Mar-Oct	0-1.5	Apparent	Oct-Jun	High	High	Moderate.
Mw: Minnewaukan	A/D	Occasional	Long	Apr-Jun	+.5-1.5	Apparent	Mar-Jul	Moderate	High	Low.
Mz:										
Moritz	C	Occasional	Brief	Mar-May	1.5-3.0	Apparent	Sep-Jun	High	High	Low.
Lamoure	C	Frequent	Brief	Mar-Oct	0-1.5	Apparent	Oct-Jun	High	High	Moderate.
Od: Oldham	C/D	None	---	---	+1-1.0	Apparent	Oct-Jun	High	Moderate	High.
Og: Orthents	A	None	---	---	>6.0	---	---	Low	Moderate	Low.
Or: Orthents	B	None	---	---	>6.0	---	---	Moderate	Moderate	Low.
Pa: Parnell	C/D	None	---	---	+1-0.5	Apparent	Jan-Dec	High	High	Low.
PbB, PbC:										
Poinsett	B	None	---	---	>6.0	---	---	High	High	Low.
Buse	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Waubay	B	None	---	---	3.5-5.0	Apparent	Oct-Jun	High	High	Low.
PwA, PwB:										
Poinsett	B	None	---	---	>6.0	---	---	High	High	Low.
Waubay	B	None	---	---	3.5-5.0	Apparent	Oct-Jun	High	High	Low.
Ra: Rauville	D	Frequent	Long	Mar-Oct	0-0.5	Apparent	Jan-Dec	High	High	Moderate.
Rp: Rauville	D	None	---	---	+2-0.5	Apparent	Jan-Dec	High	High	Moderate.
RsB, RsC:										
Renshaw	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
Sioux	A	None	---	---	>6.0	---	---	Low	Low	Low.
Rw: Renwash	B	Rare	---	---	3.5-6.0	Apparent	Mar-Jun	Low	Moderate	Low.
SbB:										
Singsaas	B	None	---	---	>6.0	---	---	Moderate	High	Low.
Buse	B	None	---	---	>6.0	---	---	Moderate	Low	Low.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
ScA, ScB:										
Singsaas	B	None	---	---	>6.0	---	---	Moderate	High	Low.
Waubay	B	None	---	---	3.5-5.0	Apparent	Oct-Jun	High	High	Low.
ShD, ShE:										
Sioux	A	None	---	---	>6.0	---	---	Low	Low	Low.
Renshaw	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
So: Southam	D	None	---	---	+5-1.0	Apparent	Jan-Dec	High	High	Low.
Sp: Spottswood	B	Occasional	Brief	Mar-Jun	1.5-3.0	Apparent	Oct-Jun	Moderate	High	Low.
SrA, SrB: Strayhoss	B	None	---	---	>6.0	---	---	High	Moderate	Low.
StB:										
Strayhoss	B	None	---	---	>6.0	---	---	High	Moderate	Low.
Maddock	A	None	---	---	>6.0	---	---	Low	Moderate	Low.
SvA: Svea	B	None	---	---	3.0-5.0	Apparent	Apr-Jun	Moderate	High	Low.
SwA:										
Swenoda	B	None	---	---	2.5-4.0	Perched	Mar-Jun	Moderate	High	Moderate.
Lanona	B	None	---	---	>6.0	---	---	Moderate	High	Moderate.
To: Tonka	C/D	None	---	---	+1-1.5	Apparent	Apr-Jun	High	High	Low.
Tr: Trent	B	None	---	---	3.5-5.0	Perched	Mar-Jun	High	Moderate	Low.
VaA, VaB:										
Venagro	B	None	---	---	>6.0	---	---	High	High	Moderate.
Svea	B	None	---	---	3.0-5.0	Apparent	Apr-Jun	Moderate	High	Low.
VbA, VbB:										
Vienna	B	None	---	---	>6.0	---	---	Moderate	High	Moderate.
Brookings	B	None	---	---	3.0-5.0	Perched	Oct-Jul	High	High	Moderate.
VnB, VnC:										
Vienna	B	None	---	---	>6.0	---	---	Moderate	High	Moderate.
Buse	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
W. Water										
Wa:										
Wakonda	B	None	---	---	2.0-4.0	Perched	Mar-Jun	High	High	Moderate.
Chancellor	C	Frequent	Brief	Mar-Oct	0-2.0	Apparent	Mar-Jun	High	High	Moderate.
Wb: Waubay	B	None	---	---	3.5-5.0	Apparent	Oct-Jun	High	High	Low.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydro- logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
WeA:										
Wentworth--------	B	None--------	---	---	>6.0	---	---	High-----	High-----	Low.
Trent------------	B	None--------	---	---	3.5-5.0	Perched	Mar-Jun	High-----	Moderate	Low.
Wo---------------- Worthing	D	None--------	---	---	+2-1.0	Perched	Jan-Dec	High-----	High-----	Moderate.

Table 19.--Classification of the Soils

Soil name	Family or higher taxonomic class
Allivar	Sandy, mixed Udic Haploborolls
Arlo	Fine-loamy over sandy or sandy-skeletal, mesic Typic Calciaquolls
Arvilla	Sandy, mixed Udic Haploborolls
Badger	Fine, montmorillonitic, frigid Typic Argiaquolls
Barnes	Fine-loamy, mixed Udic Haploborolls
Brandt	Fine-silty, mixed Udic Haploborolls
Brookings	Fine-silty, mixed Pachic Udic Haploborolls
Buse	Fine-loamy, mixed Udic Calciborolls
Castlewood	Fine, montmorillonitic, frigid Cumulic Vertic Endoaquolls
Cavour	Fine, montmorillonitic Udic Natriborolls
Chancellor	Fine, montmorillonitic, mesic Vertic Argiaquolls
Chaska	Fine-loamy, mixed (calcareous), mesic Aeric Fluvaquents
Clamo	Fine, montmorillonitic, mesic Cumulic Vertic Endoaquolls
Clarno	Fine-loamy, mixed, mesic Typic Haplustolls
Cubden	Fine-silty, frigid Aeric Calciaquolls
Darnen	Fine-loamy, mixed Pachic Udic Haploborolls
Davis	Fine-loamy, mixed, mesic Pachic Haplustolls
Dimo	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Pachic Haplustolls
Divide	Fine-loamy over sandy or sandy-skeletal, frigid Aeric Calciaquolls
Doland	Fine-loamy, mixed Udic Haploborolls
Egan	Fine-silty, mixed, mesic Udic Haplustolls
Egeland	Coarse-loamy, mixed Udic Haploborolls
Embden	Coarse-loamy, mixed Pachic Udic Haploborolls
Enet	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Pachic Haplustolls
Estelline	Fine-silty over sandy or sandy-skeletal, mixed Pachic Udic Haploborolls
Ethan	Fine-loamy, mixed, mesic Typic Calciustolls
Fairdale	Fine-loamy, mixed (calcareous), frigid Mollic Udifluvents
Fordtown	Fine-loamy over sandy or sandy-skeletal, mixed Pachic Udic Haploborolls
Fordville	Fine-loamy over sandy or sandy-skeletal, mixed Pachic Udic Haploborolls
Goldsmith	Fine-silty, mixed Pachic Udic Haploborolls
Hamerly	Fine-loamy, frigid Aeric Calciaquolls
Hetland	Fine, montmorillonitic Vertic Argiborolls
Kranzburg	Fine-silty, mixed Udic Haploborolls
La Prairie	Fine-loamy, mixed Cumulic Udic Haploborolls
LaDelle	Fine-silty, mixed Cumulic Udic Haploborolls
Lamo	Fine-silty, mixed (calcareous), mesic Cumulic Endoaquolls
Lamoure	Fine-silty, mixed (calcareous), frigid Cumulic Endoaquolls
Langhei	Fine-loamy, mixed, frigid Typic Eutrochrepts
Lanona	Coarse-loamy, mixed Udic Haploborolls
Lowe	Fine-loamy, frigid Typic Calciaquolls
Ludden	Fine, montmorillonitic, frigid Typic Endoaquerts
Maddock	Sandy, mixed Udorthentic Haploborolls
Marysland	Fine-loamy over sandy or sandy-skeletal, frigid Typic Calciaquolls
McIntosh	Fine-silty, frigid Aeric Calciaquolls
Minnewaukan	Mixed, frigid Typic Psammaquents
Moritz	Fine-loamy, frigid Aeric Calciaquolls
Oldham	Fine, montmorillonitic (calcareous), frigid Cumulic Vertic Epiaquolls
Orthents	Orthents
Parnell	Fine, montmorillonitic, frigid Vertic Argiaquolls
Poinsett	Fine-silty, mixed Udic Haploborolls
Rauville	Fine-silty, mixed (calcareous), frigid Cumulic Endoaquolls
Renshaw	Fine-loamy over sandy or sandy-skeletal, mixed Udic Haploborolls
Renwash	Fine-loamy over sandy or sandy-skeletal, mixed Udic Haploborolls
Singsaas	Fine-loamy, mixed Hapludic Vermiborolls
Sioux	Sandy-skeletal, mixed Udorthentic Haploborolls
Southam	Fine, montmorillonitic (calcareous), frigid Cumulic Vertic Endoaquolls
Spottswood	Fine-loamy over sandy or sandy-skeletal, mixed Pachic Udic Haploborolls
Strayhoss	Fine-silty over sandy or sandy-skeletal, mixed Udic Haploborolls
Svea	Fine-loamy, mixed Pachic Udic Haploborolls
Swenoda	Coarse-loamy, mixed Pachic Udic Haploborolls
Tonka	Fine, montmorillonitic, frigid Argiaquic Argialbolls
Trent	Fine-silty, mixed, mesic Pachic Haplustolls
Venagro	Fine-loamy, mixed Udic Haploborolls
Vienna	Fine-loamy, mixed Udic Haploborolls

Table 19.--Classification of the Soils--Continued

Soil name	Family or higher taxonomic class
Wakonda	Fine-silty, mixed, mesic Aquic Calciustolls
Waubay	Fine-silty, mixed Pachic Udic Haploborolls
Wentworth	Fine-silty, mixed, mesic Udic Haplustolls
Worthing	Fine, montmorillonitic, mesic Vertic Argiaquolls

Interpretive Groups

Interpretive Groups

(Absence of an entry indicates that the soil is not assigned to the interpretive group)

Map symbol	Soil name	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
Aa	Allivar	3s	Shallow to Gravel	6G	D2
Ar	Arlo	4w	Subirrigated	10	B1
AvB	Arvilla	4e	Shallow to Gravel	6G	D2
Ba	Badger	2w	Loamy Overflow	2	A
BbA	Barnes	1	Silty	3	F
BbB	Barnes	2e	Silty	3	F
BcB	Barnes	2e	Silty	3	F
	Buse	3e	Thin Upland	8	G
BeA	Brandt	1	Silty	3	F
BeB	Brandt	2e	Silty	3	F
Bf	Brookings	1	Loamy Overflow	1	K
BgC	Buse	4e	Thin Upland	8	G
	Barnes	3e	Silty	3	F
BgD	Buse	6e	Thin Upland	8	G
	Barnes	4e	Silty	3	F
BhC	Buse	7s	Thin Upland	10	NS
	Barnes	7s	Silty	10	NS
BhE	Buse	7s	Thin Upland	10	NS
	Barnes	7s	Silty	10	NS
BkE	Buse	7e	Thin Upland	10	NS
	Lamoure	6w	Subirrigated	2K	NS
BoE	Buse	7e	Thin Upland	10	NS
	Langhei	7e	Thin Upland	10	NS
BpD	Buse	6e	Thin Upland	8	G
	Poinsett	4e	Silty	3	F
BrD	Buse	7s	Thin Upland	10	NS
	Poinsett	4e	Silty	3	F
BsC	Buse	4e	Thin Upland	8	G
	Singsaas	3e	Silty	3	F
BxE	Buse	7e	Thin Upland	10	NS
	Sioux	7e	Very Shallow	10	NS

Interpretive Groups--Continued

Map symbol	Soil name	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
Ca	Castlewood	4w	Wetland	10	B1
Ch	Chaska	6w	Subirrigated	1K	NS
Cm	Clamo	4w	Clayey Overflow	10	B1
Co	Cubden	2s	Limy Subirrigated	1K	F
	Badger	2w	Loamy Overflow	2	A
Ct	Cubden	2s	Limy Subirrigated	1K	F
	Tonka	4w	Wet Meadow	10	B2
DaB	Darnen	2e	Silty	3	F
DcA	Davis	1	Loamy Overflow	1	K
DcB	Davis	2e	Silty	3	F
Dm	Dimo	2w	Loamy Overflow	1	K
Dn	Divide	3w	Limy Subirrigated	1K	D1
DoB	Doland	2e	Silty	3	F
DsA	Doland	1	Silty	3	F
	Svea	1	Loamy Overflow	1	K
EaB	Egan	2e	Silty	3	F
	Ethan	3e	Thin Upland	8	G
EeB	Egan	2e	Silty	3	F
	Wentworth	2e	Silty	3	F
	Trent	1	Loamy Overflow	1	K
EgA	Egeland	2s	Sandy	5	H
	Embden	2s	Sandy	1	H
EgB	Egeland	3e	Sandy	5	H
	Embden	3e	Sandy	1	H
EnA	Enet	2s	Silty	6G	D1
EsA	Estelline	2s	Silty	6G	D1
EsB	Estelline	3e	Silty	6G	D1
EtB	Estelline	3e	Silty	6G	D1
	Sioux	6s	Very Shallow	10	NS
EvD	Ethan	6e	Thin Upland	8	G
	Clarno	4e	Silty	3	F

Interpretive Groups--Continued

Map symbol	Soil name	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
EwC	Ethan-------------	4e	Thin Upland--------	8	G
	Egan--------------	3e	Silty--------------	3	F
Fa	Fairdale----------	6w	Loamy Overflow-----	1	NS
Fb	Fordtown----------	2s	Silty--------------	6G	D1
Fc	Fordtown----------	2s	Silty--------------	6G	D1
	Spottswood--------	2w	Loamy Overflow-----	1	K
FdA	Fordville---------	2s	Silty--------------	6G	D1
FrB	Fordville---------	3e	Silty--------------	6G	D1
	Renshaw-----------	4e	Shallow to Gravel--	6G	D2
Gs	Goldsmith---------	1	Loamy Overflow-----	1	K
Hb	Hamerly-----------	2s	Limy Subirrigated--	1K	F
	Badger------------	2w	Loamy Overflow-----	2	A
Hc	Hamerly-----------	2s	Limy Subirrigated--	1K	F
	Cavour------------	4s	Claypan------------	9L	C
	Badger------------	2w	Loamy Overflow-----	2	A
HeA	Hetland-----------	1	Silty--------------	4	F
HeB	Hetland-----------	2e	Silty--------------	4	F
KrA	Kranzburg---------	1	Silty--------------	3	F
	Brookings---------	1	Loamy Overflow-----	1	K
KrB	Kranzburg---------	2e	Silty--------------	3	F
	Brookings---------	1	Loamy Overflow-----	1	K
La	La Prairie--------	2w	Loamy Overflow-----	1	K
Lc	La Prairie--------	1	Silty--------------	1	K
Ld	LaDelle-----------	2w	Loamy Overflow-----	1	K
Le	Lamo--------------	3w	Subirrigated-------	2K	A
Lk	Lamoure-----------	3w	Subirrigated-------	2K	A
Lm	Lamoure-----------	6w	Subirrigated-------	2K	NS
	Rauville----------	5w	Wetland------------	10	NS
LnB	Lanona------------	3e	Sandy--------------	5	H
	Swenoda-----------	3e	Sandy--------------	5	H
Lo	Lowe--------------	4w	Subirrigated-------	10	A

Interpretive Groups--Continued

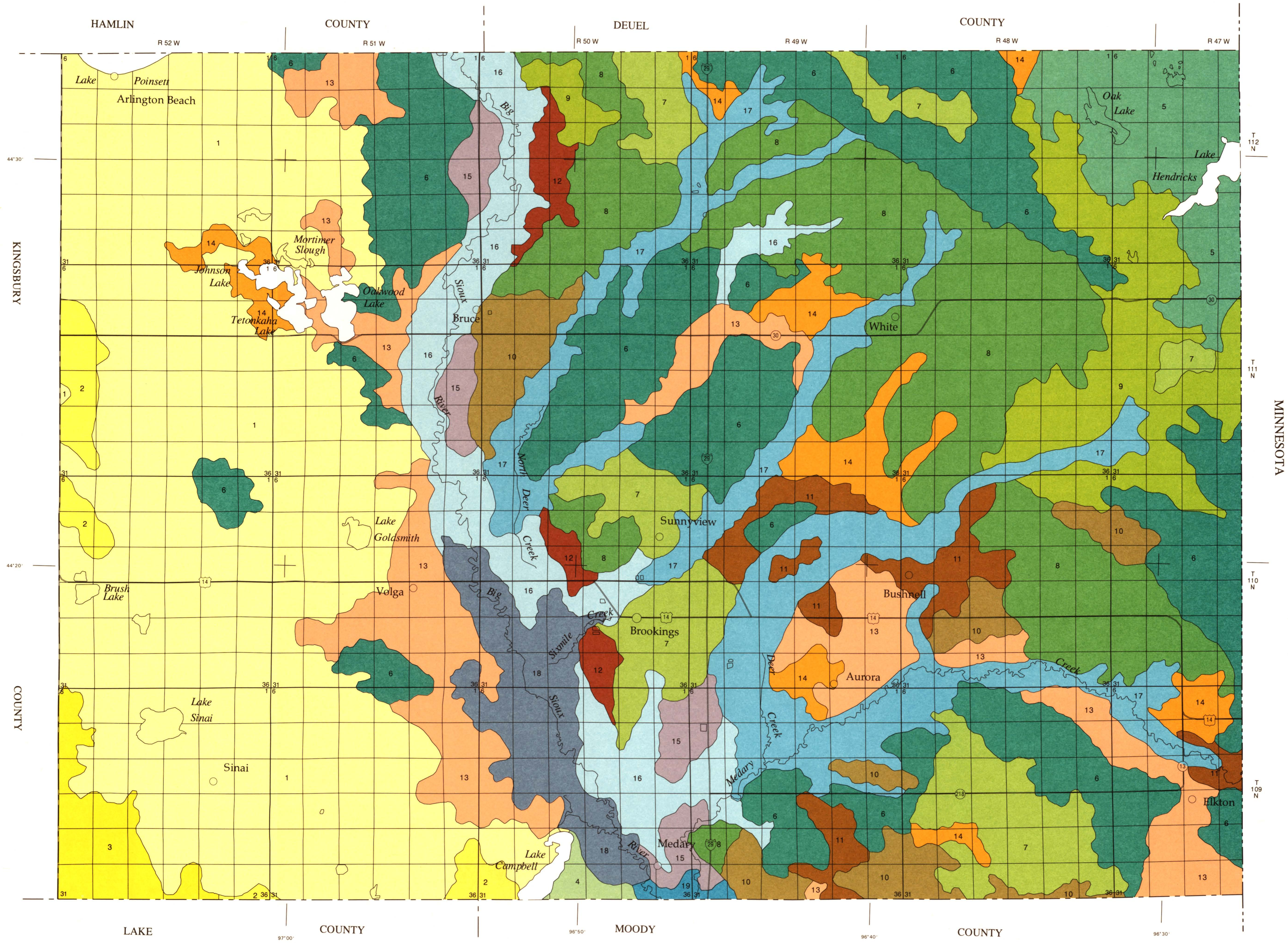
Map symbol	Soil name	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
Lr	Lowe	4w	Subirrigated	10	A
	Ludden	4w	Wetland	10	B1
Ls	Ludden	4w	Wetland	10	B1
Lu	Ludden, saline	4w	Saline Lowland	10	J
	Ludden	4w	Wetland	10	B1
MaB	Maddock	3e	Sandy	5	H
	Egeland	3e	Sandy	5	H
MaC	Maddock	4e	Sandy	5	H
	Egeland	4e	Sandy	5	H
MeA	Maddock	2s	Sandy	5	H
	Embden	2s	Sandy	1	H
Mr	Marysland	4w	Subirrigated	10	B1
Mt	McIntosh	2s	Limy Subirrigated	1K	F
	Badger	2w	Loamy Overflow	2	A
Mu	McIntosh	2s	Limy Subirrigated	1K	F
	Lamoure	4w	Subirrigated	2K	B1
Mw	Minnewaukan	4w	Subirrigated	2	A
Mz	Moritz	2s	Limy Subirrigated	1K	K
	Lamoure	4w	Subirrigated	2K	B1
Od	Oldham	5w	Wetland	10	B2
Og	Orthents	8s	Very Shallow	10	NS
Or	Orthents	4e	Thin Upland	8	G
Pa	Parnell	5w	Shallow Marsh	10	B2
PbB	Poinsett	2e	Silty	3	F
	Buse	3e	Thin Upland	8	G
	Waubay	1	Loamy Overflow	1	K
PbC	Poinsett	3e	Silty	3	F
	Buse	4e	Thin Upland	8	G
	Waubay	2e	Silty	1	K
PwA	Poinsett	1	Silty	3	F
	Waubay	1	Loamy Overflow	1	K

Interpretive Groups--Continued

Map symbol	Soil name	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
PwB	Poinsett	2e	Silty	3	F
	Waubay	1	Loamy Overflow	1	K
Ra	Rauville	5w	Wetland	10	B1
Rp	Rauville	8w	---	10	NS
RsB	Renshaw	4e	Shallow to Gravel	6G	D2
	Sioux	6s	Very Shallow	10	NS
RsC	Renshaw	4e	Shallow to Gravel	6G	D2
	Sioux	6s	Very Shallow	10	NS
Rw	Renwash	3s	Shallow to Gravel	6G	D2
SbB	Singsaas	2e	Silty	3	F
	Buse	3e	Thin Upland	8	G
ScA	Singsaas	1	Silty	3	F
	Waubay	1	Loamy Overflow	1	K
ScB	Singsaas	2e	Silty	3	F
	Waubay	1	Loamy Overflow	1	K
ShD	Sioux	6e	Very Shallow	10	NS
	Renshaw	6e	Shallow to Gravel	10	NS
ShE	Sioux	7e	Very Shallow	10	NS
	Renshaw	7e	Shallow to Gravel	10	NS
So	Southam	8w	---	10	NS
Sp	Spottswood	2w	Loamy Overflow	1	K
SrA	Strayhoss	2s	Silty	3	F
SrB	Strayhoss	2e	Silty	3	F
StB	Strayhoss	2e	Silty	3	F
	Maddock	3e	Sandy	5	H
SvA	Svea	1	Loamy Overflow	1	K
SwA	Swenoda	2s	Sandy	5	H
	Lanona	2s	Sandy	5	H
To	Tonka	4w	Wet Meadow	10	B2
Tr	Trent	1	Loamy Overflow	1	K
VaA	Venagro	1	Silty	3	F
	Svea	1	Loamy Overflow	1	K

Interpretive Groups--Continued

Map symbol	Soil name	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
VaB	Venagro	2e	Silty	3	F
	Svea	1	Loamy Overflow	1	K
VbA	Vienna	1	Silty	3	F
	Brookings	1	Loamy Overflow	1	K
VbB	Vienna	2e	Silty	3	F
	Brookings	1	Loamy Overflow	1	K
VnB	Vienna	2e	Silty	3	F
	Buse	3e	Thin Upland	8	G
VnC	Vienna	3e	Silty	3	F
	Buse	4e	Thin Upland	8	G
Wa	Wakonda	2s	Limy Subirrigated	1K	F
	Chancellor	2w	Loamy Overflow	2	A
Wb	Waubay	1	Loamy Overflow	1	K
WeA	Wentworth	1	Silty	3	F
	Trent	1	Loamy Overflow	1	K
Wo	Worthing	5w	Shallow Marsh	10	B2



SOIL LEGEND*

LEVEL TO STEEP, SILTY AND LOAMY SOILS ON TILL PLAINS, MORAINES, FLOOD PLAINS, OUTWASH PLAINS, AND ICE-WALLED LAKE PLAINS

1 Poinsett-Buse-Waubay Association

2 Poinsett-Waubay Association

3 Poinsett-Hetland-Waubay Association

4 Egan-Ethan-Trent Association

5 Singsaas-Buse-Waubay Association

6 Kranzburg-Brookings Association

7 Vienna-Brookings Association

8 Barnes Association

9 Buse-Barnes-Lamoure Association

10 Doland-Svea-Strayhoss Association

11 Strayhoss-Maddock-Doland Association

12 Lanona-Swenoda-Maddock Association

NEARLY LEVEL AND GENTLY SLOPING, SILTY AND LOAMY SOILS ON OUTWASH PLAINS

13 Estelline-Brandt Association

14 Fordville-Renshaw Association

LEVEL AND NEARLY LEVEL, LOAMY, SILTY, AND CLAYEY SOILS ON FLOOD PLAINS

15 Fordtown-Renwash-Allivar Association

16 Divide-Lamoure-Marysland Association

17 Lamoure-Moritz-Divide Association

18 Ludden-Lamoure-Rauville Association

19 Lamo-Clamo-Chaska Association

*The units on this legend are described in the text under the heading "General Soil Map Units."

Compiled 1995

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

BROOKINGS COUNTY, SOUTH DAKOTA

Scale 1:125000

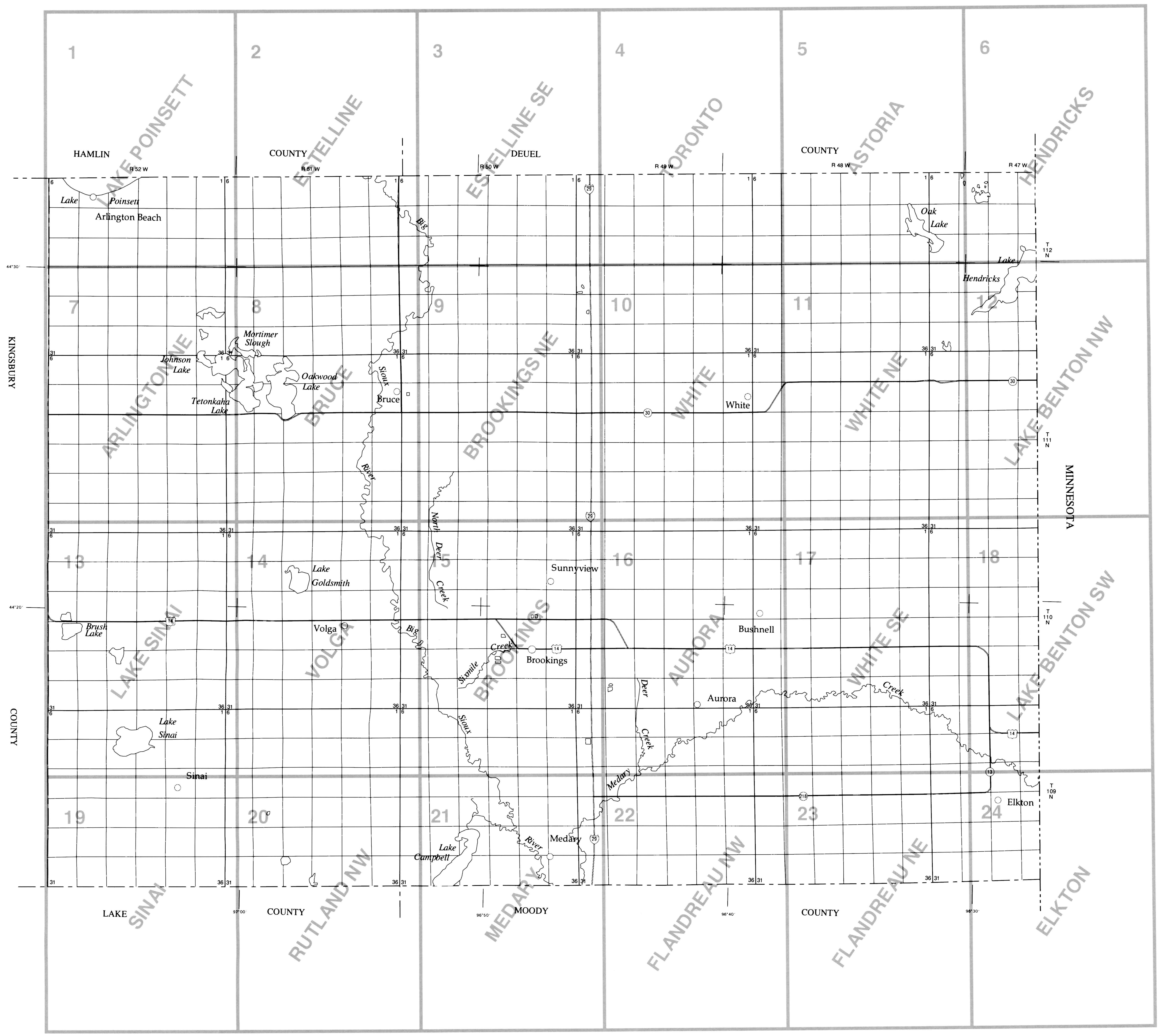
4 0 4
MILES

8 0 8
KILOMETERS

TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is meant for general planning rather than a basis for decisions on the use of specific tracts.



INDEX TO MAP SHEETS

BROOKINGS COUNTY, SOUTH DAKOTA

Scale 1:125000

MILES

KILOMETERS

TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL LEGEND

Map symbols consist of a combination of letters. The first letter is the initial letter of the map unit name. The lowercase letter that follows separates map units having names that begin with the same letter, except that it does not separate slope phases. The second uppercase letter indicates the slope class. Symbols without a letter indicating the slope class are for nearly level soils, for soils mapped at the suborder level, or for miscellaneous areas.

SYMBOL	NAME
Aa	Allivar sandy loam, 0 to 2 percent slopes
Ar	Arlo loam, 0 to 1 percent slopes
AvB	Arvilla sandy loam, 2 to 6 percent slopes
Ba	Badger silty clay loam, 0 to 1 percent slopes
BbA	Barnes clay loam, 0 to 2 percent slopes
BbB	Barnes clay loam, 2 to 6 percent slopes
BcB	Barnes-Buse loams, 2 to 6 percent slopes
BeA	Brandt silty clay loam, 0 to 2 percent slopes
BeB	Brandt silty clay loam, 2 to 6 percent slopes
Bf	Brookings silty clay loam, 0 to 2 percent slopes
BgC	Buse-Barnes loams, 6 to 9 percent slopes
BgD	Buse-Barnes loams, 9 to 20 percent slopes
BhC	Buse-Barnes loams, 2 to 9 percent slopes, very stony
BhE	Buse-Barnes loams, 9 to 40 percent slopes, very stony
BkE	Buse-Lamoure, channeled, complex, 0 to 40 percent slopes
BoE	Buse-Langhei complex, 15 to 40 percent slopes
BpD	Buse-Poinsett complex, 9 to 15 percent slopes
BrD	Buse, very stony-Poinsett complex, 9 to 25 percent slopes
BsC	Buse-Singsaas complex, 6 to 9 percent slopes
BxE	Buse-Sioux complex, 9 to 40 percent slopes
Ca	Castlewood silty clay, 0 to 1 percent slopes
Ch	Chaska loam, channeled
Cm	Clamo silty clay, 0 to 1 percent slopes
Co	Cubden-Badger silty clay loams, 0 to 2 percent slopes
Ct	Cubden-Tonka silty clay loams, 0 to 2 percent slopes
DaB	Darnen loam, 2 to 6 percent slopes
DcA	Davis loam, 0 to 2 percent slopes
DcB	Davis loam, 2 to 6 percent slopes
Dm	Dimo clay loam, 0 to 2 percent slopes
Dn	Divide loam, 0 to 2 percent slopes
DoB	Doland loam, 2 to 6 percent slopes
DsA	Doland-Svea loams, 0 to 2 percent slopes
EaB	Egan-Ethan complex, 2 to 6 percent slopes
EeB	Egan-Wentworth-Trent silty clay loams, 1 to 6 percent slopes
EgA	Egeland-Embden complex, 0 to 2 percent slopes
EgB	Egeland-Embden complex, 2 to 6 percent slopes
EnA	Enet loam, 0 to 2 percent slopes, rarely flooded
EsA	Estelline silt loam, 0 to 2 percent slopes
EsB	Estelline silt loam, 2 to 6 percent slopes
EtB	Estelline-Sioux complex, 2 to 6 percent slopes
EvD	Ethan-Clarno loams, 9 to 15 percent slopes
EwC	Ethan-Egan complex, 6 to 9 percent slopes
Fa	Fairdale loam, channeled
Fb	Fordtown loam, 0 to 2 percent slopes
Fc	Fordtown-Spottswood loams, 0 to 2 percent slopes
FdA	Fordville loam, 0 to 2 percent slopes
FrB	Fordville-Renshaw loams, 2 to 6 percent slopes
Gs	Goldsmith silty clay loam, 0 to 2 percent slopes
Hb	Hamerly-Badger complex, 0 to 2 percent slopes
Hc	Hamerly-Cavour-Badger complex, 0 to 2 percent slopes
HeA	Hetland silty clay loam, 0 to 2 percent slopes
HeB	Hetland silty clay loam, 2 to 6 percent slopes
KrA	Kranzburg-Brookings silty clay loams, 0 to 2 percent slopes
KrB	Kranzburg-Brookings silty clay loams, 1 to 6 percent slopes
La	La Prairie loam, 0 to 2 percent slopes, occasionally flooded
Lc	La Prairie loam, 0 to 2 percent slopes, rarely flooded
Ld	LaDelle silt loam, 0 to 2 percent slopes
Le	Lamo silty clay loam, 0 to 1 percent slopes
Lk	Lamoure silty clay loam, 0 to 1 percent slopes
Lm	Lamoure-Rauville silty clay loams, channeled
LnB	Lanona-Swenoda sandy loams, 2 to 6 percent slopes
Lo	Lowe loam, 0 to 1 percent slopes
Lr	Lowe-Ludden complex, 0 to 1 percent slopes
Ls	Ludden silty clay, 0 to 1 percent slopes
Lu	Ludden, saline-Ludden silty clays, 0 to 1 percent slopes
M-W	Miscellaneous water
MaB	Maddock-Egeland sandy loams, 2 to 6 percent slopes
MaC	Maddock-Egeland sandy loams, 6 to 9 percent slopes
MeA	Maddock-Embden complex, 0 to 2 percent slopes
Mr	Marysland loam, 0 to 1 percent slopes
Mt	McIntosh-Badger silty clay loams, 0 to 2 percent slopes
Mu	McIntosh-Lamoure silty clay loams, 0 to 2 percent slopes
Mw	Minnewaukan loamy sand, 0 to 3 percent slopes
Mz	Moritz-Lamoure complex, 0 to 2 percent slopes
Od	Oldham silty clay loam, 0 to 1 percent slopes
Og	Orthents, gravelly
Or	Orthents, loamy
Pa	Parnell silty clay loam, 0 to 1 percent slopes
PbB	Poinsett-Buse-Waubay complex, 1 to 6 percent slopes
PbC	Poinsett-Buse-Waubay complex, 2 to 9 percent slopes
PwA	Poinsett-Waubay silty clay loams, 0 to 2 percent slopes
PwB	Poinsett-Waubay silty clay loams, 1 to 6 percent slopes
Ra	Rauville silty clay loam, 0 to 1 percent slopes
Rp	Rauville silty clay loam, ponded
RsB	Renshaw-Sioux complex, 2 to 6 percent slopes
RsC	Renshaw-Sioux complex, 6 to 9 percent slopes
Rw	Renwash loam, 0 to 2 percent slopes
SbB	Singsaas-Buse complex, 2 to 6 percent slopes
ScA	Singsaas-Waubay silty clay loams, 0 to 2 percent slopes
ScB	Singsaas-Waubay silty clay loams, 1 to 6 percent slopes
ShD	Sioux-Renshaw complex, 9 to 15 percent slopes
ShE	Sioux-Renshaw complex, 15 to 40 percent slopes
So	Southam silty clay loam, 0 to 1 percent slopes
Sp	Spottswood loam, 0 to 2 percent slopes
SrA	Strayhoss loam, 0 to 2 percent slopes
SrB	Strayhoss loam, 2 to 6 percent slopes
StB	Strayhoss-Maddock complex, 2 to 6 percent slopes
SvA	Svea loam, 0 to 2 percent slopes
SwA	Swenoda-Lanona sandy loams, 0 to 2 percent slopes
To	Tonka silty clay loam, 0 to 1 percent slopes
Tr	Trent silty clay loam, 0 to 2 percent slopes
VaA	Venagro-Svea loams, 0 to 2 percent slopes
VaB	Venagro-Svea loams, 1 to 6 percent slopes
VbA	Vienna-Brookings complex, 0 to 2 percent slopes
VbB	Vienna-Brookings complex, 1 to 6 percent slopes
VnB	Vienna-Buse complex, 2 to 6 percent slopes
VnC	Vienna-Buse complex, 6 to 9 percent slopes
W	Water
Wa	Wakonda-Chancellor silty clay loams, 0 to 2 percent slopes
Wb	Waubay silty clay loam, 0 to 2 percent slopes
WeA	Wentworth-Trent silty clay loams, 0 to 2 percent slopes
Wo	Worthing silty clay loam, 0 to 1 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state, or province
- County or parish
- Reservation (national forest or park, state forest or park, and large airport)
- Field sheet matchline and neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK
1 890 000 FEET

LAND DIVISION CORNER
(sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads

ROAD EMBLEM & DESIGNATIONS

- Interstate
- Federal
- State

DAMS

- Medium or Small
(Named where applicable)

PITS

- Gravel pit (< 4 acres)

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban area) (occupied)
- Church

WATER FEATURES

DRAINAGE

- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
- Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial

MISCELLANEOUS WATER FEATURES

- Sewage Lagoon
- Wet spot (< 4 acres)

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

SHORT STEEP SLOPE

MISCELLANEOUS

- Gravelly spot (<4 acres)
- Sandy spot (<4 acres)
- Stony spot, very stony spot (<4 acres)

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North American Datum of 1927 (NAD27). Clarke 1866 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

LAKE POINSETT (OVERSIZE), SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 1 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
ESTELLINE QUADRANGLE
SHEET NUMBER 2 OF 24

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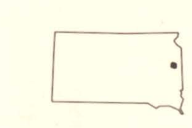
NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES



QUADRANGLE LOCATION

ESTELLINE, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 2 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
ESTELLINE SE QUADRANGLE
SHEET NUMBER 3 OF 24

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SCALE 1:24000

QUADRANGLE LOCATION

ESTELLINE SE, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 3 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
TORONTO QUADRANGLE
SHEET NUMBER 4 OF 24

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North American Datum of 1927 (NAD27), Clarke 1866 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 14.
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NORTH

SCALE 1:24000

1 0 1 KILOMETERS

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 MILES

QUADRANGLE LOCATION

TORONTO, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 4 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
ASTORIA QUADRANGLE
SHEET NUMBER 5 OF 24

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North American Datum of 1927 (NAD27). Clarke 1866 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

ASTORIA, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 5 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
HENDRICKS QUADRANGLE
SHEET NUMBER 6 OF 24

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North American Datum of 1927 (NAD27). Clarke 1866 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

HENDRICKS, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 6 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
ARLINGTON NE (OVERSIZE) QUADRANGLE
SHEET NUMBER 7 OF 24

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NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

ARLINGTON NE (OVERSIZE), SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 7 OF 24

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NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

BRUCE, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 8 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
BROOKINGS NE QUADRANGLE
SHEET NUMBER 9 OF 24

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North American Datum of 1927 (NAD27). Clarke 1866 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 14.
Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

BROOKINGS NE, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 9 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
WHITE QUADRANGLE
SHEET NUMBER 10 OF 24

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North American Datum of 1927 (NAD27). Clarke 1866 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

SCALE 1:24000

KILOMETERS

FEET

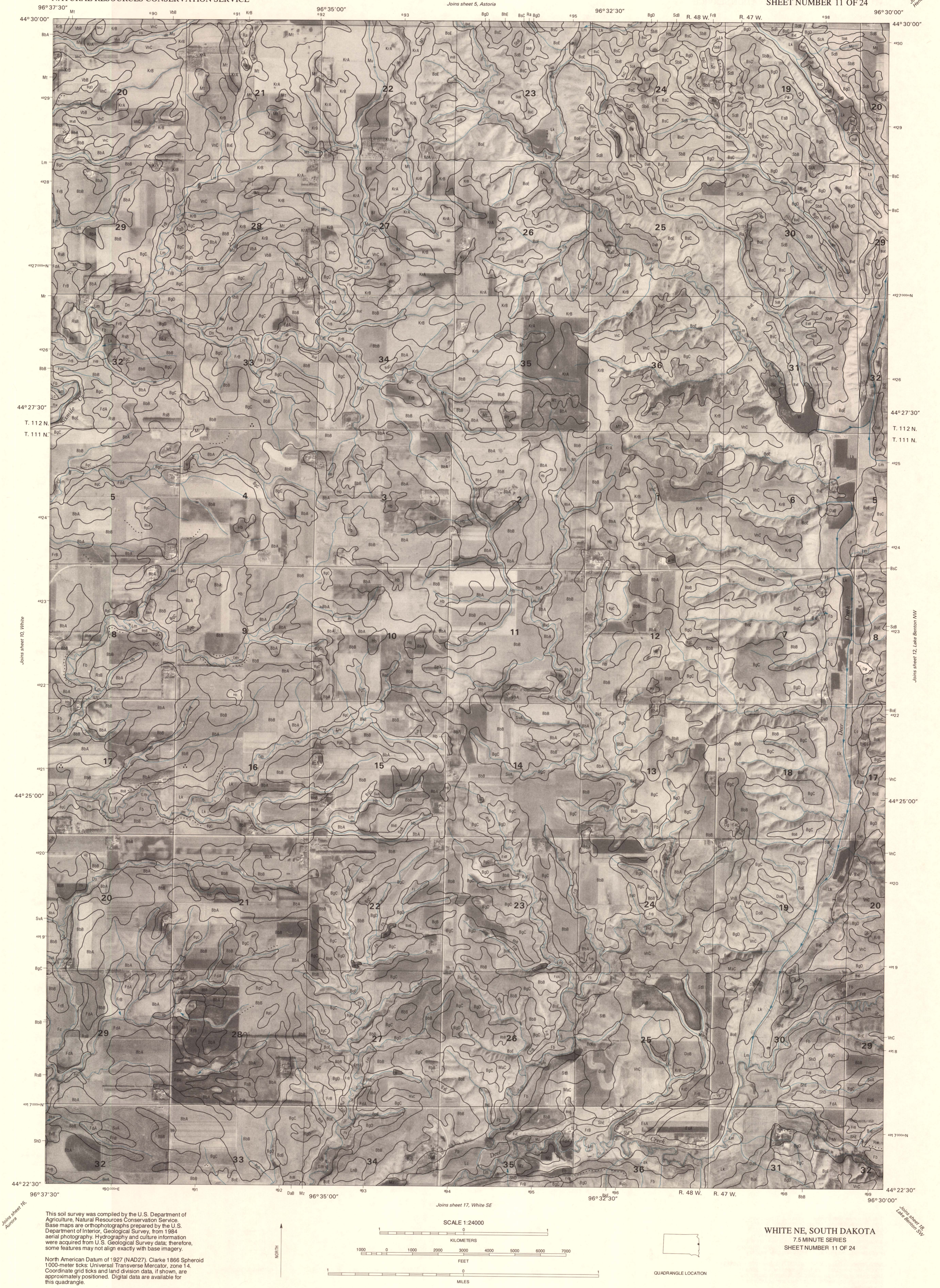
MILES

QUADRANGLE LOCATION

WHITE, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 10 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
WHITE NE QUADRANGLE
SHEET NUMBER 11 OF 24



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North American Datum of 1927 (NAD27). Clarke 1866 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

WHITE NE, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 11 OF 24

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North American Datum of 1927 (NAD27). Clarke 1866 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 14.
Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

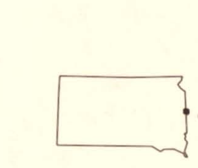
NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES



QUADRANGLE LOCATION

LAKE BENTON NW, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 12 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
LAKE SINAI (OVERSIZE) QUADRANGLE
SHEET NUMBER 13 OF 24

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North American Datum of 1927 (NAD27). Clarke 1866 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

SCALE 1:24000

1 0 1
KILOMETERS

1000 0 1000 2000 3000 4000 5000 6000 7000
FEET

1 0 1
MILES

QUADRANGLE LOCATION

LAKE SINAI (OVERSIZE), SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 13 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
VOLGA QUADRANGLE
SHEET NUMBER 14 OF 24

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North American Datum of 1927 (NAD27). Clarke 1866 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

VOLGA, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 14 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
BROOKINGS QUADRANGLE
SHEET NUMBER 15 OF 24

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North American Datum of 1927 (NAD27). Clarke 1866 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

SCALE 1:24000

1 0 1
KILOMETERS

1000 0 1000 2000 3000 4000 5000 6000 7000
FEET

1 0 1
MILES

QUADRANGLE LOCATION

BROOKINGS, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 15 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
AURORA QUADRANGLE
SHEET NUMBER 16 OF 24

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NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

AURORA, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 16 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
WHITE SE QUADRANGLE
SHEET NUMBER 17 OF 24

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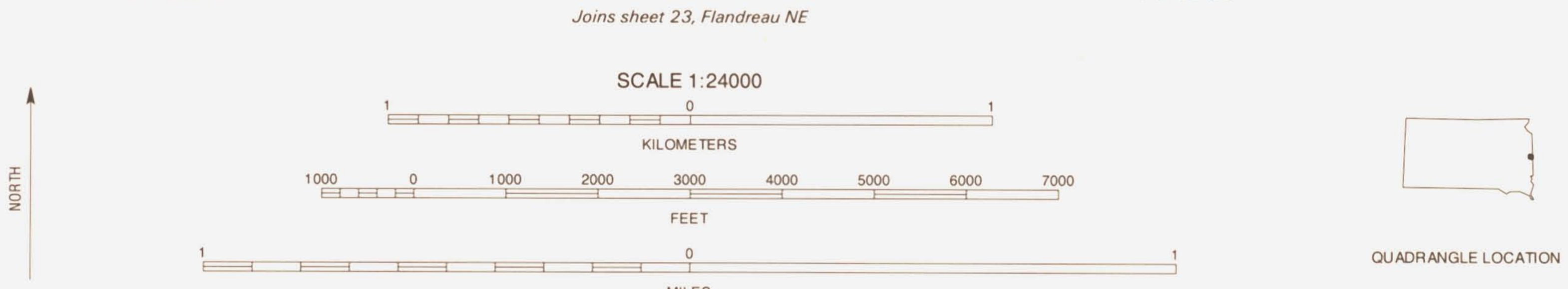

WHITE SE, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 17 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
LAKE BENTON SW QUADRANGLE
SHEET NUMBER 18 OF 24

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NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

LAKE BENTON SW, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 18 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
SINAI (OVERSIZE) QUADRANGLE
SHEET NUMBER 19 OF 24

Joins sheet 14, Volga

Joins sheet 13, Lake Sinai (Oversize)

Joins sheet 20, Rutland NW

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NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

SINAI (OVERSIZE), SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 19 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
RUTLAND NW QUADRANGLE
SHEET NUMBER 20 OF 24

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NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

RUTLAND NW, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 20 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
MEDARY QUADRANGLE
SHEET NUMBER 21 OF 24

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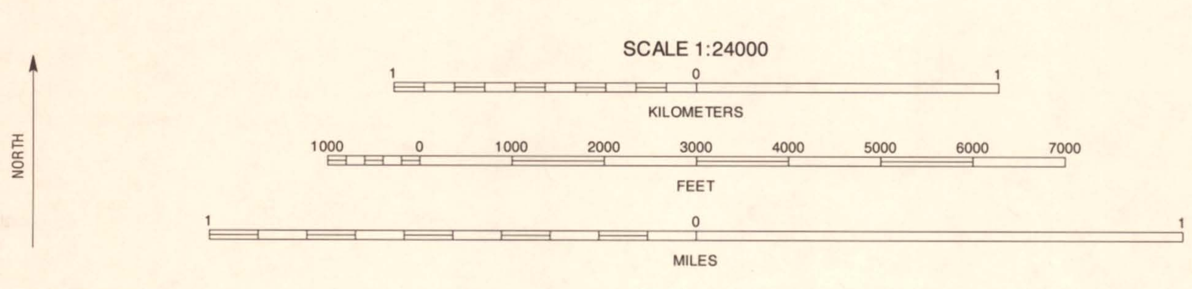

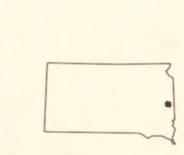

QUADRANGLE LOCATION

MEDARY, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 21 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
FLANDREAU NW QUADRANGLE
SHEET NUMBER 22 OF 24

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NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

FLANDREAU NW, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 22 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
FLANDREAU NE QUADRANGLE
SHEET NUMBER 23 OF 24

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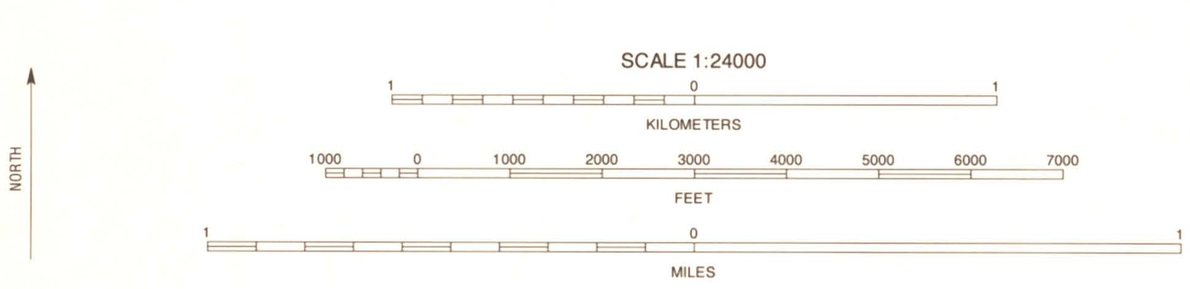

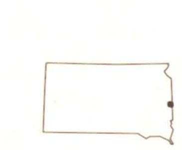

QUADRANGLE LOCATION

FLANDREAU NE, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 23 OF 24

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BROOKINGS COUNTY, SOUTH DAKOTA
ELKTON QUADRANGLE
SHEET NUMBER 24 OF 24

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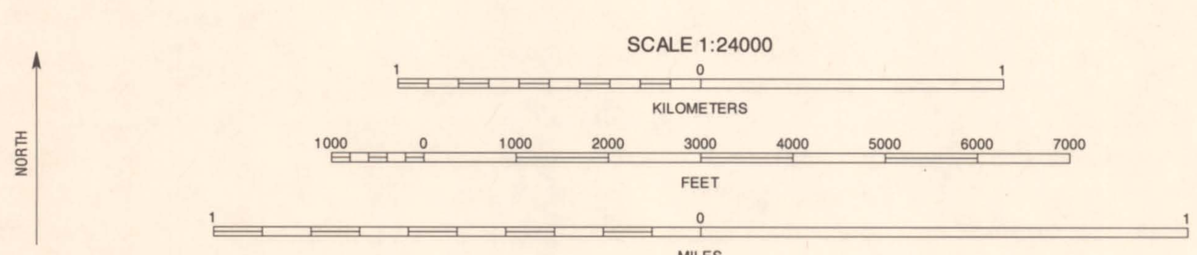

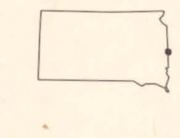
QUADRANGLE LOCATION

ELKTON, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 24 OF 24